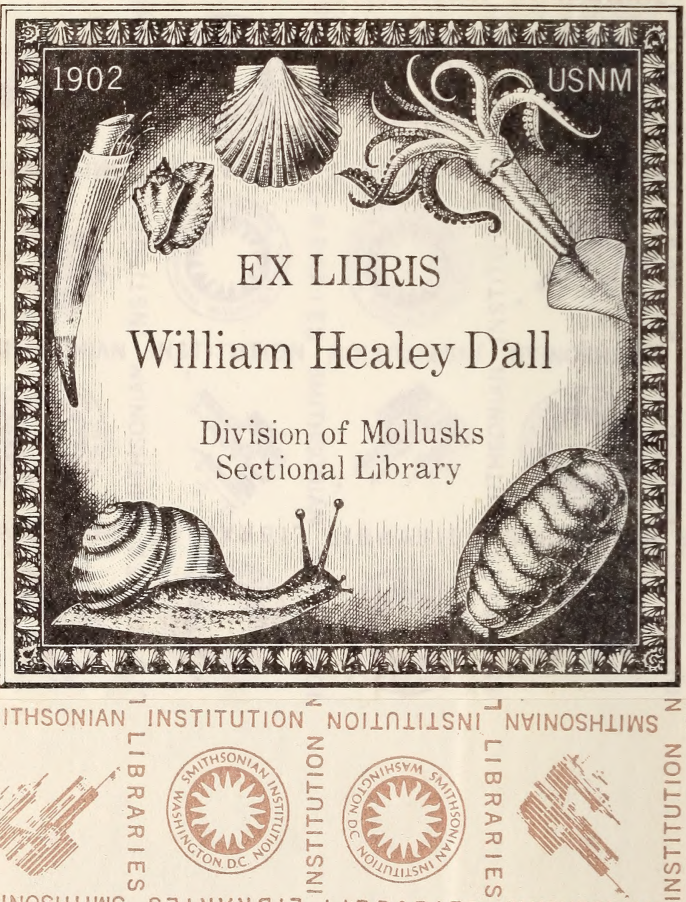
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PROCEEDINGS

OF THE

Boston Society of Natural History.

VOL. XIII.

1869–1871.

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PROCEEDINGS

OF THE

BOSTON SOCIETY OF NATURAL HISTORY.

TAKEN FROM THE SOCIETY'S RECORDS.

Annual Meeting, May 5, 1869.

Vice President Dr. C. T. Jackson in the chair. Forty-eight members present.

Mr. S. H. Scudder presented the following Report of the Custodian for the past year: —

In my last annual report I alluded to a topic which although not directly connected with the operations of the Society, seemed to demand its earnest attention. I refer to the refusal of the State Legislature to act upon the petition of the Society's Council for an extension of the proposed new edition of Dr Gould's Invertebrates of Massachusetts. Owing to the necessary and most fortunate delay in the publication of this work, an opportunity offered itself for a renewal of our plea, before a committee and a legislature more open to reasonable suggestions; and to-night I am happy to state that although the cost of the original edition was found to be largely in excess of the estimates, a Resolve was introduced into the House of Representatives on the twentieth of April last, both supplying the requisite deficiency, and authorizing an increased edition of eight hundred copies. Four hundred copies were to be given to this Society for distribution "to foreign public institutions of a similar nature,

by direction of its Council and in behalf of the State," and one hundred copies to the editor, Mr. Binney, "to be distributed among conchologists in this and foreign countries, in behalf of the State"; this resolve was referred to the Committee of Finance, who have, as yet, taken no formal action upon it; I am assured, however, that there is little doubt of their favorable report and of the final success of the measure.

The history of the past twelve months differs little from that of the preceding year. There have been twenty general meetings of the Society, ten of the Section of Entomology and six of the Section of Microscopy. At the general meetings the average attendance of members has been thirty-three, at those of the Section of Entomology nearly twelve, and at the Microscopical meetings nearly eight. This does not include ladies who attended nearly one half of the general meetings in response to a recent invitation of the Society. So few, however, availed themselves of the opportunity, that should they be included, the average attendance at the general meetings would only be increased to thirty-five. One hundred and five scientific communications have been presented by forty-nine persons, viz., sixty-seven communications by thirty-six persons at the general meetings; thirty-three communications by thirteen persons at the meetings of the Entomological Section, and five communications by three persons at those of the Microscopical Section. The following are their titles:—

ALLEN, J. A. Notes on Birds observed in Western Iowa, in the months of July, August and September; also on Birds observed in Northern Illinois, in May and June, and at Richmond, Wayne Co., Indiana, between June third and tenth. *June* 3, 1868.

Catalogue of the reptiles and batrachians found in the vicinity of Springfield, Mass., with notices of all the other species known to inhabit the State. *December* 2, 1868.

Appendix to a paper on the reptiles and batrachians of Massachusetts. *January* 20, 1869.

ATWOOD, CAPT. N. E. Observations upon the habits of the sperm whale. *June* 3, 1868.

Description of Carcharias tigris Atw. *January* 20, 1869.

Remarks upon the history of the halibut and other edible fish. *April* 7, 1869.

BICKMORE, A. S. Notice of some birds from the Island of Buru. *November* 18, 1868.

Remarks on the animal of Nautilus pompilius. *November* 18, 1868.

On a collection of shells of Nautilus of various ages. *December* 2, 1868.

Remarks on the Babirusa and its distribution. *December* 2, 1868.

BLAKE, W. P. Remarks upon the Ainos. *June* 17, 1868.

BREWER, DR. T. M. Remarks upon the death of Mr. John Cassin. *January* 20, 1869.

BRIGHAM, W. T. Notes on Hesperomannia, a new genus of Hawaiian Compositæ. (With illustrations.) *May* 6, 1868.

Notice of a new and remarkable eruption of Mauna Loa on the Hawaiian Islands. *June* 3, 1868.

Remarks upon Mr. N. S. Shaler's Considerations concerning the absence of distinct evidences of glacial action in the valley of the Yukon River, Alaska. *November* 4, 1868.

Remarks at the announcement of the death of Mr. Horace Mann. *November* 18, 1868.

On the results of Mr. Mann's study of the Hawaiian Flora. *November* 18, 1868.

The eruption of the Hawaiian Volcanoes, 1868. (With illustrations.) *December* 2, 1868.

Volcanic manifestations in New England. *April* 7, 1869.

BROWN, DR. F. H. Some observations on the fauna of Madeira. *December* 2, 1868.

BURGESS, E. On the habits of Anisomorpha buprestoides. *February* 24, 1869.

COLBY, DR. E. P. Note on the habits of Bryaxis luniger Lec. *November* 25, 1868.

Cope, E. D. On the Reptilian orders, Pythonomorpha and Streptosauria. *January* 20, 1869.

Descriptions of extinct fishes previously unknown. *February* 3, 1869.

Coues, Dr. E. Synopsis of the Birds of S. Carolina. *October* 7, 1868.

Cresson, E. T. Descriptions of North American Bees, No. I. *December* 2, 1868.

Descriptions of North American Bees, No. II. *January* 20, 1869.

Notes on Mexican Pompilidæ, with descriptions of new species. *March* 24, 1869.

Dall, W. H. Remarks upon the Natural History of Alaska. *November* 4, 1868.

Dole, S. B. A synopsis of the Birds hitherto described from the Hawaiian Islands. *February* 3, 1869.

Frost, Charles C. A further enumeration of N. England Fungi. *May* 20, 1868.

Gaffield, T. On the accidental presence of water in glass stoppers. *March* 3, 1869.

Greenleaf, R. C. Remarks on the double plate of Aulacodiscus oreganus. *March* 10, 1869.

List of Diatoms from Ashley River, S. Car. *March* 10, 1869.

Hagen, Dr. H. Rectification of a previous paper on Hodotermes japonicus. *October* 28, 1868.

Notice of an imago of Morpho Ilioneus with a caterpillar's head. *November* 25, 1868.

Upon the manufacture of microscopes. *March* 10, 1869.

On the diseases of injurious insects. *March* 24, 1869.

On the recent manufacture of cheap objectives for microscopes. *April* 14, 1869.

Hills, Luther. Notice of a new locality for minerals, in Auburn, Me. *July* 1, 1868.

HOY, DR. G. R. On the nidification of Cooper's Hawk. *April* 7, 1869.

Notes on the Rough-winged Swallow and the Yellow-bellied Fly-catcher. *April* 21, 1869.

HYATT, A. Remarks upon Mr. Shaler's Considerations concerning the absence of distinct evidences of glacial action in the valley of the Yukon River, Alaska. *November* 4, 1868.

On the gradual involution of Cephalopods during life. *December* 2, 1868.

JACKSON, DR. C. T. Analysis of Petrosilex from Melrose. *June* 3, 1868.

Description of the beds of Apatite in North Burgess, Canada West. *June* 17, 1868.

Description of a new locality for tin ore in Winslow, Me. *January* 20, 1869.

JEFFRIES, DR. B. JOY. Remarks upon the discovery and structure of Euplectella speciosa. *May* 6, 1868.

Remarks upon the projection of after-pictures. *June* 3, 1868.

Upon the principle of the Thaumatrope. *July* 1, 1868.

Observations on the vision of Fishes and Amphibians. *December* 16, 1868.

Remarks upon experiments with after-images. *February* 17, 1869.

On the method of accommodation in the eyes of birds. *April* 21, 1869.

MCGUIER, HENRY. On the evidences of the antiquity of man, deduced from the excavations at High Rock Spring, Saratoga, N. Y. *April* 21, 1869.

MANN, B. P. On the preservation of larvæ in carbolic acid. *November* 25, 1868.

MANN, HORACE. Notes on Alsinidendron, Platydesma and Brighamia, new genera of Hawaiian Plants; with an analysis of the Hawaiian Flora. (With illustrations.) *December* 2, 1868.

MARSH, O. C. Observations on the metamorphosis of Siredon into Amblystoma. *September* 16, 1868.

MINOT, C. S. Notice of the broods of Chrysophanus americanus. *September* 23, 1868.

Description of the male of Hesperia Metea. *February* 24, 1869.

On the limits of genera. *March* 24, 1869.

Notice of some abnormal cocoons of Bombycidæ. *April* 28, 1869.

MOORE, N. B. Notes upon the habits of the Night Hawk in Lousiana. *October* 7, 1868.

MORSE, E. S. On the land-slides in the vicinity of Portland, Maine. (With illustrations.) *January* 6, 1869.

Remarks on the minuter classification of land snails. *February* 17, 1869.

NILES, W. H. Remarks on the occurrence of recent shells at a great depth below Fort Warren, Boston Harbor. *January* 6, 1869, *March* 17, 1869.

Ancient operations in the Petroleum Region of Pennsylvania. *March* 17, 1869.

PAPENDIEK, E. Notice of the occurrence of Silpha atrata in Milton, Mass. *March* 24, 1869.

PERRY, REV. J. B. Sketch of the life of the late Dr. E. Emmons. *December* 2, 1868.

Observations on some Indian Relics in Swanton, Vt. *December* 2, 1868.

POURTALES, L. F. DE. On some deep sea dredging between Cuba and the Florida Keys. *October* 7, 1868.

PUTNAM, F. W. On some ancient utensils from Nicaragua. *December* 2, 1868.

SANBORN, F. G. Description and history of a new species of Erirhinus, E. juniperinus. *May* 27, 1868.

Description of the larva and pupa case of Microdon globosus Fabr. (With illustrations.) *June* 24, 1868.

On the habits of Heterocerus fatuus Kiesenw. *June* 24, 1868.

Remarks on a number of interesting insects. *September* 22, 1868.

Intelligence in the larva of Elaphidion villosum. *January* 27, 1869.

Recent discovery of Boreus brumalis, in Mass. *April* 28, 1869.

Schlagintweit R. von. Remarks upon Nephrite from Turkistan. *October* 21, 1868.

Scudder, S. H. Brief account of the migratory grasshoppers of the United States. *June* 17, 1868.

Experiments upon the reproduction of lost limbs in the Walking Stick, Diapheromera femorata. *September* 23, 1868.

Notice of a Chalciditan, parasitic in the eggs of Œdipoda carolina. *September* 23, 1868.

A century of Orthoptera: Decade I, Gryllides. *October* 28, 1868.

Remarks upon Mr. Shaler's Considerations concerning the absence of distinct evidences of glacial action in the valley of the Yukon River, Alaska. *November* 4, 1868.

Remarks upon the arrangement of the families of Orthoptera. *December* 23, 1868.

Notes on Orthoptera collected by Prof. James Orton on either side of the Andes of equatorial South America. *February* 24, 1869.

A study of the gigantic lobe-crested Grasshoppers of Central and South America. *February* 24, 1869.

Report upon a collection of diurnal Lepidoptera, made in Alaska by the scientific corps of the Russo-American telegraph expedition, under the direction of Lieut. W. H. Dall. *April* 28, 1869.

Notice of a new cave insect from N. Zealand. *April* 28, 1869.

Shaler, N. S. On the nature of the movements involved in the changes of level of shore lines. (With illustrations.) *October* 7, 1868.

On the disappearance of the cane from the central part of the Ohio valley. *October* 7, 1868.

Considerations concerning the absence of distinct evidences of glacial action in the valley of the Yukon River, Alaska. *November* 4, 1868.

Notes on the concentric structure of granitic rocks. *February* 3, 1869.

Smith, G. D. List of Coleoptera collected by Prof. James Orton in Ecuador and Brazil. *February* 24, 1869.

Smith, S. I. Notes on new or little known species of American cancroid Crustacea. *February* 3, 1869.

STODDER, C. Remarks upon Dr. Woodward's photographs of Nobert's test plate. *November* 11, 1868.

SUMICHRAST, F. The geographical distribution of the native birds of the department of Vera Cruz, with a list of the migratory species, translated by Dr. T. M. Brewer. *December* 16, 1868.

TROUVELOT, L. Upon the comparative study of juvenile larvæ. *June* 24, 1868.

On an interesting habit of the larva of Papilio Turnus. *June* 24, 1868.

Notice of some points of analogy between Limacodes and some Hymenoptera. *June* 24, 1868.

UHLER, P. R. Notices of the Hemiptera obtained by the expedition of Prof. James Orton in Ecuador and Brazil. *February* 24, 1869.

VERRILL, A. E. On new and imperfectly known Echinoderms and Corals. *April* 7, 1869.

WHITNEY, C. P. Description of a new species of Thecla. *November* 25, 1868.

WHITTLESEY, COL. C. The physical geology of Eastern Ohio. (With illustrations.) *February* 3, 1869.

WYMAN, DR. J. On a thread worm (Filaria anhingæ) infesting the brain of the snake bird (Photus anhinga). (With illustrations.) *October* 7, 1868.

On the mode of formation of the Dighton Rock inscriptions. *December* 2, 1868.

Five corresponding and twenty-nine resident members have been elected during the year. Of the resident members six have not complied with the requirements of the Constitution, and their names are not placed on our rolls; two others who have paid the entrance fee have not yet signed the Constitution.

The Lectures given under the auspices of the Society are coming into more general notice, and are therefore better

attended. Three courses have been delivered during the winter and spring. The first course consisted of four lectures upon Optical Phenomena, by Dr. B. Joy Jeffries; the second of twelve lectures upon the Geological History of North America, by Mr. W. H. Niles, and the third of twelve lectures, several of which are yet to be given, upon Plant Life, by Mr. W. T. Brigham. The first course was but little advertised, and being also upon a limited subject, attracted but a slender audience; the second course was attended by an average of sixty-six persons; and the third, delivered in the evening, by an audience averaging thus far ninety-nine persons.

Perhaps the large amount of the Society's publications has been the most noticeable feature in the history of the past year. We have issued no less than the equivalent of one thousand two hundred and twenty-nine octavo pages, a number at least double that of any previous year of our history. It was announced in the last report that our publications, and especially the Proceedings, would appear with greater promptness than before; and we can say with just pride that no Society in this country can at all compete with us in this respect; during the greater part of the year,—and had it not been for one unforeseen and unavoidable strain upon our printing office, we should have said during the whole year,—we have placed upon the table at each meeting of the Society, a part, at least, of the printed Proceedings of the previous meeting; this has been scarcely more difficult, no more expensive, and to our subscribers and contributors in every way more satisfactory than the former deliberate method of issuing our publications. We are now placing a press in our printing office, so that, with the exception of stereotyping, all our future work will be done within our own walls, and with still greater promptness.

The twelfth volume of our Proceedings, begun a year ago,

has reached the four hundredth page, and includes the records of the last regular meeting, held a fortnight ago to-day. Early in the year we published the Annual Report and our first Annual, of one hundred and twenty-eight pages, with which you are all familiar; in the winter an outline Physical map of North America, to be used in indicating the boundaries of the geographical distribution of animals and plants; a large edition was printed, and copies are sold at cost to induce students to engage in a study which promises the best results. Recently we have issued two important works, the fourth and concluding part of the first volume of our Memoirs, and the first volume of our Occasional Papers; the former included papers by Col. Whittlesey, upon the weapons and military character of the ancient mound builders of the West, and upon the physical geology of Eastern Ohio; by Mr. Vose on the distortion of pebbles in conglomerates, mainly drawn from his studies near Rangeley Lake in Maine; by Mr. Allen upon the birds which he observed in Iowa, Illinois and Indiana; by Mr. Brigham upon Hesperomannia, and upon the recent eruption of the Hawaiian volcanoes; by the late Mr. Mann upon new genera of Hawaiian plants, with an analysis of the Hawaiian flora; and by Prof. Sumichrast upon the geographical distribution of the birds of Vera Cruz, in Mexico.

Our new octavo series, called "Occasional Papers," is introduced by a volume of the Entomological Correspondence of the late Dr. T. W. Harris, edited by the Secretary; the body of the work is made up of both sides of the correspondence between Dr. Harris and Prof. Hentz, Drs. Melsheimer, LeConte, Zimmermann and LeBaron, Miss Morris, and Messrs. Doubleday, Herrick, Say, Darling and Higginson. Numerous notes, principally upon the earlier stages of Insects, are added from Dr. Harris's MSS., and some articles which originally appeared in obscure and now inaccessible Journals, are republished. An interesting Memoir of the author is given by Col. Higginson, and a steel portrait from a photograph furnished

by the family is prefixed. The work is also embellished by steel plates and woodcuts.

We must again express our great indebtedness to the Smithsonian Institution for the liberality with which they transmit our publications from Washington to foreign countries, and receive returns for us through their European agents, free of charge. This system of interchange, initiated many years ago by the Smithsonian Institution, has proved of immense advantage to American Societies, not only in a monetary point of view, but in the simplicity of the method and the certainty of its results. It is, however, much to be desired that the transmission from this country could be made with greater frequency, not so much for our own sake as for that of our foreign correspondents; while parcels are forwarded to us at an average interval of three or four weeks, we do not send our own publications more than once a year; indeed many of our transactions do not reach our foreign friends until a year after their publication. This year our transmissions have been twice as large as usual, that for 1868 having been forwarded immediately after the Annual Meeting, and that for 1869 a few weeks ago. We have sent away 737 parts of our Memoirs, 312 parts of the old Journal, 254 complete volumes of the Proceedings, unbound sheets of the same equivalent to 367 volumes, 303 copies of the Harris Correspondence, 340 copies of the first Annual, and 597 copies of the Annual Reports, equal in all to three quarters of a million of octavo pages.

In response to our special requests, we have been favored by the following Societies, with many early volumes of their Publications: —

Naturhistorischer Verein des Preussischen Rheinlandes	Bonn.
Société Linnéenne	Bordeaux.
Schlesische Gesellschaft für vaterländische Cultur .	Breslau.
* Physiographiske Forening	Christiania.
* Royal Physical Society	Edinburgh.

Naturforschende Gesellschaft	Freiburg i. B.
" "	Görlitz.
Naturhistorische "	Hannover.
Finska Vetenskaps-Societeten	Helsingfors.
* Provinciaal Genootschap van Kunsten en Wetenschappen	Hertogenbosch.
Geological and Polytechnic Society of the West Riding of Yorkshire	Leeds.
* Zeitschrift für wissenschaftliche Zoologie . . .	Leipzig.
Academia Lugduno-Batava	Leyden.
* Société Impériale des Sciences, de l'Agriculture et des Arts	Lille.
Royal Geographical Society	London.
* The Zoölogist	"
Königliche Realschule	Meseritz.
* Société Impériale d'Agriculture	Moscou.
" " des Naturalistes	"
Die Pollichia: naturwissenschaftlicher Verein der Rheinpfalz	Neustadt.
* Ministère de la Marine	Paris.
* Muséum d'Histoire Naturelle	"
Société des Antiquaires de France	"
" Géologique de France	"
* " Impériale et Centrale d'Agriculture . . .	"
* Universidad de Chile	Santiago.
K. K. Zoologisch-botanische Gesellschaft . . .	Wien.

Of these we must particularly express our thanks to the Imperial Society of Antiquaries, the Minister of the Marine, the Imperial Society of Agriculture, the Geological Society and the Museum of Natural History,—all of Paris, the University of Chili, the Leyden Academy, the new Magazine of Natural History at Christiania, the Provincial Society of Science and Arts in North Brabant, and the Imperial Society of Science, etc., of Lille; they have favored us with extensive series of great importance.

The following institutions, in addition to those prefixed by an asterisk in the list above, have been added to our circle of correspondents.

State Agricultural Society	Albany.
Ministère de l'Intérieur du Royaume des Pays-Bas .	Amsterdam.
Natural History and Philosophical Society . . .	Belfast.
Cambridge Philosophical Society	Cambridge, Eng.
Naturwissenschaftliche Gesellschaft	Chemnitz.

Oekonomische Gesellschaft im Königreich Sachsen .	Dresden.
Botanical Society	Edinburgh.
Società Entomologica Italiana	Firenze.
Deutsche Malakozoologische Gesellschaft . . .	Frankfurt a. M.
Universität	Kiel.
Historic Society of Lancashire and Cheshire . . .	Liverpool.
Geological Magazine	London.
Journal of Travel and Natural History	"
Scientific Opinion	"
Scientific Students' Association	Manchester.
Naturhistorischer Verein von Wisconsin . . .	Milwaukee.
Reale Istituto d'Incoraggiamento alle Scienze Naturali .	Napoli.
American Agriculturist	New York.
Revue et Magazin de Zoologie	Paris.
Société des Antiquaires	"
Lotos: Zeitschrift für Naturwissenschaften . . .	Prag.
Le Naturaliste Canadien	Quebec.
American Entomologist	St. Louis.
Allgemeine Schweizerische Gesellschaft für die gesammten Naturwissenschaften	Switzerland.
Canadian Entomologist	Toronto.

The accompanying table gives a summary of the additions to the Library by volumes, parts of volumes, pamphlets and maps or charts.

	Octavo.			Quarto.			Folio.			Maps and Ch'ts	To'l
	vls	pts	ph	vls	pts	ph	vls	pts	ph		
Books presented by individuals . .	101	63	156	22		3	4	3		58	410
" " " Publishing Com.	1	35	10		1	6				1	54
" purchased (Wolcott Fund) .	18	1		3	3	2		5			32
" deposited in Binney library .				2	2						4
" " by the Republican Institution	6										6
" received in exchange . . .	300	551	103	86	189	41	10	42	1	2	1325
Total .	426	650	269	113	195	52	14	50	1	61	1831

The arrangement of the books in the back library, not completed at the time of the last report, was finished shortly after; since then the alcove catalogue of the whole library has been completed, while the correction of the card catalogue,

necessitated by the almost entire rearrangement of the books on furnishing the new library, is advancing as rapidly as possible. The constant employment of a binder in the building has wrought a most agreeable change in the appearance of our shelves. Six hundred and seventy-seven books have been bound, and more than five hundred volumes are at this time in various stages of completion. But the work of the binder has not been limited to the library, for besides the folding of the signatures of our Proceedings and of extras issued to authors, six hundred copies of the Harris Correspondence, and over four hundred volumes of the Proceedings have been bound in cloth, and more than four hundred numbers of the Journal stitched. The binder has also been employed in some outside work, for which the Society charges but a slight advance upon the cost, and which is permitted by the Council in order to lessen the immediate expense incurred. The work of the library assistants has been greatly increased, by the necessary preparation of so many books for the binder, and as their time has also been partly occupied by the Curators, much work still remains unfinished; notwithstanding the continual employment of a second assistant, the mass of pamphlets still remains inaccessible; all new pamphlets, however, have been catalogued as soon as received, and perhaps one tenth of the old ones are now upon the shelves.

636 books have been borrowed from the library by 82 persons.

In connection with the Smithsonian Institution, the Society has continued to carry on explorations in Central America. Since Col. Grayson's return from the island of Socorro, he has been investigating the natural history of the Sierra Madre, but no returns are expected for several months to come. Col. Grayson's account of his expedition to Socorro and the Tres Marias, sent to us for publication, has been revised and partly annotated by Prof. Baird, but still remains in his hands, awaiting the result of additional excursions on the

main land, that the peculiar fauna of that region may be more fairly represented. In consequence, none of the birds obtained by Col. Grayson have yet been distributed, but a fine collection from Costa Rica, identified by Mr. Lawrence, and kindly presented to us by Professor Henry, is an earnest of what we may expect from time to time; indeed, our collection of birds bids fair to exhibit in the course of a few years a more complete representation of the fauna of North-west Mexico and the adjacent islands, than can be found outside of the Museum of the Smithsonian Institution.

We have also contributed toward an exploration of the isthmus of Tehuantepec from ocean to ocean, carried on through the patronage of the Smithsonian Institution by Prof. Sumichrast, a most assiduous and scientific collector. It will probably continue for one or two years, and a few returns have already been received and distributed to various parties for identification. The expedition promises to be very successful.

For several months we have been employing one of our members, Mr. W. H. Dall, to select specimens from the Smithsonian duplicates, partly in return for the contribution we made toward their Explorations, partly as a direct gift from the Institution. We have already received many fossils and mollusks, and are daily expecting a large collection of the nests and eggs of birds.

By the favor of the Mayor and Chief of Police, two officers are detailed on museum days to protect our collections and preserve order; they render most efficient aid, without which we think it would be impossible to maintain our practice of opening the museum twice a week.

There have been more than 36,000 visitors to the Museum during the year, but it has been impossible to keep an accurate record; the enumeration has often been a partial one and at times estimates had to take the place of more careful counting. The Museum has been open to the public 104

days; on Thursdays, by ticket, 52 days; the average attendance on public days has been at least 336.

In the department of Mammals and Comparative Anatomy a very desirable step has been taken, authorizing the Curator to obtain mounted specimens of all our New England mammals; to make room for them the Ethnological collections will be removed. For several months the department was left without a curator, but lately the objects have been placed in better order, and recently acquired specimens put on exhibition. The principal additions have been a black bear and an antelope, both in a fresh condition, one received from Mr. W. T. Adams, and the other from the City, through Mr. J. Galvin.

The collection of mounted birds has been rearranged so as to bring it into more convenient view, and a case for skins completed, which will enable the Curator to arrange the unmounted birds more safely than has heretofore been possible. In accordance with the request made in last year's report, the collection of land birds of Massachusetts has been enriched by a number of specimens, and especially by a donation of twenty-five birds from Mr. L. L. Thaxter of Newton. Mrs. Bryant has again laid the department under obligation for a valuable and extensive collection of unmounted birds from the West Indies and Central and South America, and Prof. Henry of the Smithsonian Institution has presented eighty specimens of Costa Rican birds, all of which have been labelled by Mr. Lawrence.

The department of the nests and eggs of birds has been entirely rearranged and newly labelled, and is now in a very satisfactory condition. In round numbers the collection consists of the eggs of seven hundred birds, viz:—four hundred American, two hundred European, and one hundred from various parts of the world; about one hundred and fifty of the whole number are accompanied by nests; this estimate includes a

collection of European eggs which the Curator purposes to present as soon as he can select them. Other important accessions have been received. Over fifteen hundred duplicates of eggs of about fifty species, most valuable for exchange, were given by Mrs. Bryant, and about two hundred and fifty nests and eggs selected by the Curator, were presented by the Smithsonian Institution. About thirty specimens from Europe have been received in exchange, and a small number of nests and eggs purchased.

The following list of the nests and eggs of birds in our collection has been prepared by the Curator, with the assistance of Mr. Sanborn; any not specified would be acceptable additions to this department; they are all the gift of the late Dr. Henry Bryant, excepting those prefixed by an asterisk; *n.* following the name of the bird signifies that the nest alone is in the collection; *n. e.* signifies nest and eggs; in all other cases the eggs only are meant.

BIRDS OF NORTH AMERICA NORTH OF MEXICO.

Cathartes aura Illig.
Cathartes atratus Lesson.
Falco anatum Bonaparte.
Hypotriorchis columbarius Gr.
Falco candicans Gmelin.
Falco islandicus Sabine.
Tinnunculus sparverius Vieill.
Astur atricapillus Bonap.
Accipiter Cooperii Bonap.
Accipiter fuscus Bonap.
* Buteo calurus Cassin.
Buteo borealis Vieill.
Buteo montanus Nuttall.
Buteo lineatus Jardine.
Archibuteo lagopus Gray.
Archibuteo ferrugineus Gray.
Elanus leucurus Bonap.
Ictinia mississippiensis Gray.
Circus hudsonius Vieillot.
* Aquila canadensis Cassin.
Haliaetus leucocephalus Savigny.
Pandion carolinensis Bon.
Polyborus tharus Cassin.
Craxirex unicinctus Cassin.
Bubo virginianus Bonap.
Scops asio Bonap.
Otus Wilsonianus Lesson.
Brachyotus Cassinii Brewer.
* Syrnium nebulosum Gray.
Crotophaga ani Linn.
Geococcyx californianus Baird.
Coccygus americanus Bonap. n. e.
Coccygus erythrophthalmus Bonap.
Picus villosus Linn.
Picus pubescens Linn.
Picoides arcticus Gray.
Sphyropicus varius Baird.
Centurus carolinus Bonap.
Centurus flaviventris Sw.
Melanerpes erythrocephalus Sw.
* Melanerpes formicivorus Bonap.
Melanerpes torquatus Bonap.

Colaptes auratus Swainson.
Colaptes mexicanus Swains.
* Lampornis mango Swains. n.
Trochilus colubris Linn. n. e.
Atthis Anna Reichenb. n. e.
Chætura pelasgia Steph. n. e.
Antrostomus carolinensis Gould.
Antrostomus vociferus Bonap.
Antrostomus Nuttalli Cassin.
Chordeiles popetue Baird.
Chordeiles Henryi Cassin.
Chordeiles texensis Lawrence.
Ceryle alcyon Boie.
Milvulus forficatus Sw. n. e.
Tyrannus carolinensis Baird. n. e.
Tyrannus dominicensis Rich.
Tyrannus verticalis Say. n. e.
Tyrannus vociferans Sw. n. e.
Myiarchus crinitus Cab.
Myiarchus mexicanus Baird. n. e.
Sayornis nigricans Bonap. n. e
Sayornis fuscus Baird. n. e.
* Sayornis Sayus Baird. n.
* Contopus Richardsonii Baird. n.
Contopus virens Cab. n. e.
Empidonax Traillii Baird. n. e.
* Empidonax pusillus Cab. n. e.
Empidonax minimus Baird. n. e.
* Empidonax acadicus Baird. n. e.
Empidonax flaviventris Baird.
* Empidonax difficilis Baird. n. e.
Pyrocephalus mexicanus Sclat.
Turdus mustelinus Gm. n. e.
Turdus Pallasi Cab.
Turdus fuscescens Stephens. n. e.
Turdus ustulatus Nuttall. n. e.
Turdus Swainsonii Cab. n. e.
Turdus Aliciae Baird. n. e.
Turdus migratorius Linn. n. e.
* Saxicola œnanthe Bechst.
Sialia sialis Baird. n. e.
Sialia mexicana Swains. n. e.
Anthus ludovicianus Licht.
Mniotilta varia Vieill. n.
Parula americana Bonap.
Geothlypis trichas Cab. n. e.
* Geothlypis Macgillivrayi Baird. n.
Icteria viridis Bonap. n. e.
Icteria longicauda Lawr. n. e.
Helminthophaga chrysoptera B. n. e.
Helminthophaga ruficapilla Bd. n. e.
Helminthophaga celata Baird. n. e.
Helminthophaga peregrina Cab.
Seiurus aurocapillus Sw. n. e.
Seiurus noveboracensis Nutt. n. e.
* Seiurus ludovicianus Bonap. n. e.
Dendroica virens Baird. n. e.
Dendroica coronata Gray. n. e.
Dendroica Blackburniæ Baird.
Dendroica castanea Baird.
* Dendroica pinus Baird. n. e.
Dendroica pennsylvanica Baird. n. e.
Dendroica striata Baird. n. e.
Dendroica æstiva Baird. n. e.
Dendroica maculosa Baird. n. e.
* Dendroica discolor Baird. n. e.
Myiodioctes mitratus Aud.
Setophaga ruticilla Sw. n. e.
Pyranga rubra Vieill.
Pyranga æstiva Vieill.
Hirundo horreorum Barton. n. e.
Hirundo lunifrons Say.
Hirundo bicolor Vieill.
Cotyle riparia Boie. n. e.
Cotyle serripennis Bonap.
Progne purpurea Boie.
Ampelis garrulus Binn.
Ampelis cedrorum Baird. n. e.
Collyrio ludovicianus Baird.
Collyrio excubitoroides Baird. n. e.
Vireo olivaceus Vieill.
Vireo altiloquus Gray. n. e.
Vireo gilvus Bonap.
Vireo Belli Aud. n. e.
Vireo noveboracensis Bonap. n. e.
* Vireo solitarius Vieill.
Vireo flavifrons Vieill. n. e.
Mimus polyglottus Boie.
Mimus carolinensis Gray. n. e.
Oreoscoptes montanus Baird.
Harporhynchus redivivus Cab. n. e.
Harporhynchus cinereus Xantus.
Harporhynchus curvirostris Cab.
Harporhynchus longirostris Cab.

Harporhynchus rufus Cab.
Campylorhynchus brunneicapillus Gray. n. e.
* Campylorhynchus affinis Xantus. n.e.
Thryothorus ludovicianus Bonap. n. e.
Cistothorus palustris Cab.
Cistothorus stellaris Cab. n. e.
Troglodytes ædon Vieill. n. e.
Troglodytes Parkmanni Aud.
Sitta carolinensis Gmelin.
* Sitta pygmæa Vigors. n.
Polioptila cærulea Sclat. n. e.
Parus atricapillus Linn.
Parus carolinensis Aud.
Psaltriparus minimus Bonap. n. e.
Paroides flaviceps Baird. n. e.
Certhiola flaveola Sund. n. e.
Eremophila cornuta Boie.
Carpodacus purpureus Gray. n. e.
Carpodacus frontalis Gray. n. e.
Chrysomitris tristis Bonap. n. e.
Chrysomitris psaltria Bonap. n. e.
Chrysomitris Lawrencii Bonap. n. e.
Ægiothus linaria Cab.
Ægiothus fuscescens Coues. n. e.
Plectrophanes lapponicus Selby. n. e.
Plectrophanes pictus Sw. n. e.
* Plectrophanes ornatus Towns. n. e.
Plectrophanes Maccownii Lawr.
Passerculus savanna Bonap. n. e.
Passerculus anthinus Bonap.
Passerculus alaudinus Bonap. n. e.
Pooecetes gramineus Baird. n.
* Coturniculus passerinus Bonap. n. e.
Coturniculus Henslowi Bonap.
Ammodromus caudacutus Sw.
Ammodromus maritimus Sw.
Chondestes grammaca Bonap. n. e.
Zonotrichia leucophrys Sw.
Zonotrichia Gambelii Nutt. n. e.
Zonotrichia albicollis Bonap. n. e.
* Junco oregonus Sclat. n. e.
Junco hyemalis Sclat. n. e.
* Poospiza bilineata Sclat. n. e.
Spizella monticola Baird. n. e.
Spizella pusilla Bonap. n. e.
Spizella socialis Bonap. n. e.
Spizella pallida Bonap. n. e.
* Spizella Breweri Cass. n. e.
Melospiza melodia Baird. n. e.
Melospiza Lincolnii Baird.
Melospiza palustris Baird.
Peucæa æstivalis Cab.
Peucæa Cassinii Baird.
Passerella iliaca Sw.
Calamospiza bicolor Bonap.
Euspiza americana Bonap. n. e.
Guiraca ludoviciana Sw. n. e.
Guiraca melanocephala Sw. n. e.
* Guiraca cærulea Sw. n. e.
Cyanospiza ciris Baird. n. e.
Cyanospiza amœna Baird. n. e
Cyanospiza cyanea Baird.
Pyrrhuloxia sinuata Bonap.
Cardinalis virginianus Bonap. n. e.
Cardinalis igneus Baird.
Pipilo erythrophthalmus Vieill. n. e.
Pipilo fuscus Sw. n. e.
* Pipilo chlorura Baird. n. e.
* Pipilo albigula Baird. n. e.
Dolichonyx oryzivorus Sw. n. e.
Molothrus pecoris Sw.
Agelaius phœniceus Vieill. n. e.
Agelaius gubernator Bonap.
Xanthocephalus icterocephalus Bd. n. e.
Trupialis militaris Bonap.
Sturnella magna Sw.
Sturnella neglecta Aud.
Icterus Audubonii Giraud.
Icterus parisorum Bonap.
Icterus cucullatus Swains.
Icterus spurius Bonap. n. e.
Icterus baltimore Daudin. n. e.
Icterus Bullockii Bonap. n. e.
Scolecophagus ferrugineus Sw. n. e.
Scolecophagus cyanocephalus Cab. n. e.
Quiscalus macroura Sw.
Quiscalus major Vieill.
Quiscalus versicolor Vieill. n. e.
Corvus carnivorus Bartram.
Corvus cryptoleucus Couch.
Corvus americanus Aud.

Corvus ossifragus Wilson.
Pica hudsonica Bonap.
Cyanura cristata Sw. n. e.
Cyanocitta californica Strick.
Cyanocitta floridana Bonap.
Columba leucocephala Linn.
Ectopistes migratoria Sw.
Zenaida amabilis Bonap.
Melopelia leucoptera Bonap.
Zenaidura carolinensis Bonap.
Scardafella squamosa Bonap. n. e.
Chamæpelia passerina Sw.
Oreopeleia martinica Reich.
Ortalida M'c Calli Baird.
Meleagris gallopavo Linn.
Meleagris mexicana Gould.
Tetrao obscurus Say.
Tetrao canadensis Linn.
Centrocercus urophasianus Sw.
Pediœcetes phasianellus Baird.
Cupidonia cupido Baird.
Bonasa umbellus Steph.
Lagopus albus Aud.
Lagopus Reinhardtii.
Ortyx virginianus Bonap.
Ortyx texanus Lawr.
Oreortyx pictus Baird.
Lophortyx californicus Bonap.
Cyrtonyx massena Gould.
Grus canadensis Temm.
Demiegretta Pealii Baird.
Demiegretta rufa Baird.
Demiegretta ludoviciana Baird.
Garzetta candidissima Bonap.
Herodias egretta Gray.
Herodias californica Baird.
Ardea herodias Linn.
Audubonia occidentalis Bonap.
Florida cærulea Baird.
Ardetta exilis Gray.
Botaurus lentiginosus Steph.
Butorides virescens Bonap.
Nyctiardea gardeni Baird.
Nyctherodius violaceus Reich.
Tantalus loculator Linn.
Ibis alba Vieillot.
Ibis Ordii Bonaparte.
Platalea ajaja Linn.
Phœnicopterus ruber Linn.
Charadrius virginicus Borck.
Ægialitis vociferus Cassin.
Ægialitis Wilsonius Cassin.
Ægialitis semipalmatus Cab.
Ægialitis melodus Cab.
* Squatarola helvetica Cuv.
Haematopus palliatus Temm.
* Strepsilas melanocephala Vig.
Recurvirostra americana Gm.
Himantopus nigricollis Vieillot.
Phalaropus Wilsonii Sab.
Phalaropus hyperboreus Temm.
* Phalaropus fulicarius Bonap.
Philohela minor Gray.
Gallinago Wilsonii Bonap.
* Macrorhamphus griseus Leach.
Tringa maritima Brünnich.
* Tringa Wilsonii Nuttall.
Ereunetes petrificatus Ill.
Symphemia semipalmata Hartl.
Gambetta flavipes Bonap.
* Rhyacophilus solitarius Bonap.
Tringoides macularius Gray.
* Philomachus pugnax Gray.
Actiturus bartramius Bonap.
* Tryngites rufescens Cab.
Limosa hudsonica Sw.
Numenius longirostris Wils.
* Numenius hudsonicus Latham.
* Numenius borealis Latham.
Rallus elegans Aud.
Rallus crepitans Gm.
Rallus virginianus Linn. n. e.
Porzana carolina Vieill.
Crex pratensis Bechst.
Fulica americana Gmelin.
Gallinula galeata Bonap.
Gallinula martinica Lath.
Cygnus americanus Sharpless.
* Cygnus buccinator Rich.
* Anser hyperboreus Pallas.
Anser Gambelii Hartlaub.
Bernicla canadensis Boie.
* Bernicla Hutchinsii Bonap.
* Bernicla nigricans Cassin.

* Chloephaga canagica Bonap.
Dendrocygna autumnalis Eyton.
Anas boschas Linn.
Anas obscura Gm.
Dafila acuta Jenyns.
Nettion carolinensis Baird.
Nettion crecca Kaup.
Querquedula discors Steph.
Querquedula cyanopterus Cassin.
Spatula clypeata Boie.
Chaulelasmus streperus Gray.
Mareca americana Stephens.
Mareca Penelope Bonap.
Aix sponsa Boie.
Fulix marila Baird.
Fulix affinis Baird.
* Fulix collaris Baird.
Aythya americana Bonap.
Aythya vallisneria Bonap.
Bucephala americana Baird.
* Bucephala albeola Baird.
Harelda glacialis Leach.
* Lampronetta Fischeri Brandt.
Melanetta velvetina Baird.
Pelionetta perspicillata Kaup.
Somateria mollissima Leach. n. e.
* Somateria v-nigra Gray.
* Somateria spectabilis Leach.
Erismatura rubida Bonap.
Mergus americanus Cass.
Mergus serrator Linn.
Lophodytes cucullatus Reich.
* Pelecanus erythrorhynchus Gm.
Pelecanus fuscus Linn.
Sula bassana Briss.
Sula fiber Linn.
Tachypetes aquila Vieillot.
Graculus carbo Gray.
Graculus dilophus Gray.
Graculus floridanus Bonap.
Graculus penicillatus Bonap.
Graculus violaceus Gray.
Plotus anhinga Linn.
Phaeton flavirostris Brandt.
* Procellaria glacialis Linn.
* Thalassidroma furcata Gould.
Thalassidroma Leachii Temm.
* Thalassidroma pelagica Bonap.
* Puffinus anglorum Temm.
Puffinus obscurus Lath.
Stercorarius parasiticus Temm.
Stercorarius cepphus Ross.
Larus glaucus Brünn.
Larus glaucescens Licht.
Larus leucopterus Faber.
Larus marinus Linn.
Larus argentatus Brünn.
Larus occidentalis Aud.
Larus californicus Lawr.
Larus delawarensis Ord.
Larus brachyrhynchus Rich.
Chroicocephalus atricilla Linn.
Chroicocephalus Franklinii Br.
Chroicocephalus philadelphia Lawr.
Rissa tridactyla Bonap.
* Xema Sabinii Bonap.
Sterna aranea Wils.
Sterna regia Gambel.
Sterna acuflavida Cabot.
Sterna fuliginosa Gm.
Sterna Wilsoni Bonap.
Sterna macroura Naum.
Sterna Forsteri Nutt.
Sterna paradisea Brünn.
Sterna frenata Gambel.
Hydrochelidon plumbea Wils.
Anous stolidus Leach.
Rhynchops nigra Linn.
Colymbus torquatus Brünn.
Colymbus arcticus Linn.
Colymbus pacificus Lawr.
Colymbus septentrionalis Linn.
Podiceps griseigena Gray.
Podiceps occidentalis Lawr.
Podiceps cornutus Latham.
Podiceps californicus Heermann.
Podilymbus podiceps Lawr.
Alca torda Linn.
Mormon cirrhata Bonap.
Mormon arctica Illiger.
Cerorhina monocerata Cassin.
Uria grylle Latham.
Uria columba Cassin.
Uria carbo Brandt.

Uria lomvia Brünnich.
Uria ringvia Brünnich.
Uria arra Pallas.

BIRDS OF EUROPE.

* Haliætus albicilla Leach.
* Buteo vulgaris Bechst.
* Archibuteo lagopus Brehm.
* Pernis apivorus Bonap.
* Milvus regalis Briss.
* Milvus niger Briss.
* Falco lithofalco Gmel.
* Falco tinnunculus Linn.
* Falco cenchris Naum.
* Astur palumbarius Bechst.
* Accipiter nisus Pall.
* Circus æruginosus Savigr.
* Circus cyaneus Boie.
* Circus cineraceus Naum.
* Syrnium aluco Brehm.
* Strix flammea Linn.
* Otus vulgaris Flemm.
* Scops Aldrovandi Willughb.
* Picus major Linn.
* Picus medius Linn.
* Gecinus viridis Boie.
* Gecinus canus Boie.
* Yunx torquilla Linn.
* Cuculus canorus Linn.
Coracias garrula Linn.
* Merops apiaster Linn.
* Alcedo ispida Linn.
* Sitta europæa Linn.
* Certhia familiaris Linn.
* Upupa epops Linn.
* Corvus corax Linn.
* Corvus corone Linn.
* Corvus cornix Linn.
* Corvus frugilegus Linn.
* Corvus monedula Linn.
* Pyrrhocorax alpinus Vieill.
* Pica caudata Linn.
* Pica cyanea Wagl.
* Garrulus glandarius Vieill.
* Lanius minor Gmel.
* Lanius rufus Briss.
* Lanius collurio Linn.
* Sturnus vulgaris Linn.
* Passer domesticus Briss.
* Passer hispaniolensis Degl.
* Passer montanus Briss.
* Pyrrhula vulgaris Temm.
* Coccothraustes vulgaris Vieill.
* Ligurinus chloris Koch.
* Fringilla cælebs Linn.
* Montifringilla nivalis Brehm.
* Carduelis elegans Steph.
* Chrysomitris spinus Boie.
* Serinus meridionalis Bonap.
* Cannabina linota G. R. Gray.
* Cannabina flavirostris Brehm.
* Linaria borealis Vieill.
* Linaria rufescens Vieill.
* Miliaria europæa Swains.
* Emberiza citrinella Linn.
* Emberiza cia Linn.
* Emberiza hortulana Linn.
* Cynchramus schœniclus Boie.
* Plectrophanes lapponicus Selby.
* Alauda arvensis Linn.
* Alauda arborea Linn.
* Otocoris alpestris Bonap.
* Melanocorypha calandra Boie.
* Galerida cristata Boie.
* Agrodroma campestris Swains.
* Anthus arboreus Bechst.
* Anthus pratensis Bechst.
* Anthus spinoletta Bonap.
* Anthus obscurus Keys. et Blas.
* Budytes flava Bonap.
* Motacilla alba Linn.
* Motacilla Yarrellii Gould.
* Oriolus galbula Linn.
* Turdus merula Linn.
* Turdus torquatus Linn.
* Turdus pilaris Linn.
* Turdus viscivorus Linn.

* Turdus musicus Linn.
* Rubecula familiaris Blyth.
* Philomela luscinia Selby.
* Cyanecula suecica Brehm.
* Ruticilla phœnicura Bonap.
* Ruticilla tithys Brehm.
* Saxicola œnanthe Bechst.
* Pratincola rubetra Koch.
* Pratincola rubicola Koch.
* Prunella modularis Vieill.
* Sylvia atricapilla Scop.
* Sylvia hortensis Lath.
* Curruca garrula Briss.
* Curruca orphea Boie.
* Curruca cinerea Briss.
* Curruca melanocephala Boie.
* Hypolais icterina Z. Gerbe.
* Hypolais olivetorum Z. Gerbe.
* Hypolais elæica Z. Gerbe.
* Calamoherpe turdoides Boie.
* Calamoherpe arundinacea Boie.
* Calamoherpe palustris Boie.
* Locustella naevia Degl. n.
* Calamodyta phragmitis Mey et Wolf.
* Troglodytes parvulus Koch.
* Phyllopneuste trochilus Brehm.
* Phyllopneuste rufa Bonap.
* Phyllopneuste sibilatrix Brehm.
* Regulus cristatus Charlet.
* Regulus ignicapillus Licht.
* Parus major Linn.
* Parus ater Linn.
* Parus cæruleus Linn.
* Orites caudatus G. R. Gray.
* Panurus biarmicus Koch.
* Muscicapa nigra Briss.
* Butalis grisola Boie.
* Hirundo rustica Linn.
* Chelidon urbica Boie.
* Cotyle riparia Boie.
* Cypselus apus Ill.
* Cypselus melba Ill.
* Caprimulgus europæus Linn.
* Columba palumbus Linn.
* Columba œnas Linn.
* Columba livia Briss.
* Turtur auritus Ray.
* Lagopus scoticus Bonap.
* Lagopus mutus Leach.
* Tetrao urogallus Linn.
* Tetrao tetrix Linn.
* Perdix græca Briss.
* Perdix rubra Briss.
* Perdix petrosa Lath.
* Starna cinerea Bonap.
* Coturnix communis Bonnatt.
* Phasianus colchicus Linn.
* Otis tetrax Linn.
* Glareola pratincola Leach.
* Œdicnemus crepitans Temm.
* Pluvialis apricarius Bonap.
Charadrius hiaticula Linn.
* Vanellus cristatus Meyer et Wolf.
* Hæmatopus ostralegus Linn.
* Numenius arquata Lath.
* Limosa ægocephala Leach.
* Scolopax rusticula Linn.
* Gallinago scolopacinus Bonap.
* Tringa maritima Brünn.
* Pelidna cinclus Bonap.
* Machetes pugnax G. Cuv.
* Totanus calidris Bechst.
* Totanus glareola Temm.
* Actitis hypoleucos Boie.
* Phalaropus fulicarius Bonap.
* Lobipes hyperboreus Steph.
* Recurvirostra avocetta Linn.
* Himantopus candidus Bonnatt.
* Rallus aquaticus Linn.
* Crex pratensis Bechst.
* Porzana maruetta G. R. Gray.
* Gallinula chloropus Lath.
* Fulica atra Linn.
* Ardea cinerea Linn.
* Ardea purpurea Linn.
* Egretta garzetta Bonap.
* Bubulcus ibis Bonap.
* Buphus comatus Boie.
* Ardeola minuta Bonap.
* Botaurus stellaris Steph.
* Nycticorax europæus Steph.
* Ciconia alba Willughb.

* Ciconia nigra Gesn.
* Phatalea leucorhodia Linn.
* Sula bassana Briss.
  Phalacrocorax carbo Leach.
* Phalacrocorax cristatus Steph.
* Phalacrocorax pygmæus Dum.
* Procellaria glacialis Linn.
* Puffinus anglorum Boie.
  Puffinus obscurus Boie.
* Thalassidroma pelagica Selby.
* Thalassidroma Bulweri Bonap.
* Stercorarius catarractes Vieill.
* Stercorarius pomarinus Vieill.
* Stercorarius parasiticus G. R. Gray.
  Larus glaucus Brünn.
  Larus leucopterus Ferber.
  Larus marinus Linn.
* Larus fuscus Linn.
  Larus argentatus Brünn.
* Larus canus Linn.
  Larus tridactylus Linn.
* Larus ridibundus Linn.
* Sterna cantiaca Gmel.
* Sterna hirundo Linn.
* Sterna paradisea Brünn.
* Sterna minuta Linn.
* Hydrochelidon fissipes G. R. Gray.
* Hydrochelidon nigra G. R. Gray.
* Cygnus ferus Ray.
* Anser cinereus Meyer.
* Anser sylvestris Briss.
* Tadorna Belonii Ray.
* Anser erythropus Newton.
* Spatula clypeata Boie
* Anas boschas Linn.
* Chaulelasmus strepera G. R. Gray.
* Mareca penelope Selby.
* Dafila acuta Eyton.
* Querquedula crecca Steph.
* Clangula islandica Bonap.
  Harelda glacialis Steph.
* Somateria mollissima Boie.
  Oidemia nigra Flem.
  Oidemia fusca Flem.
* Mergus merganser Linn.
* Mergus serrator Linn.
* Podiceps cristatus Lath.
* Podiceps fluviatilis Degl.
* Uria troile Lath.
  Uria ringvia Brünn.
  Uria arra Keys. et Blas.
  Uria grylle Lath.
* Uria Mandtii Lichst.
* Mergulus alle Vieill.
* Fratercula arctica Vieill.
* Fratercula corniculata Brandt.
  Alca torda Linn.

BIRDS OF JAMAICA.

  Crotophaga ani Linn.
  Tyrannus griseus Vieill.
  Tyrannus caudifasciatus D'Orbign.
  Myiarchus validus Cab.
  Myiarchus stolidus Gosse.
* Dendroica petechia Sclat. n.
* Petrochelidon fulva Cab.
* Progne dominicensis March.
* Tachornis phœnicobia Gosse. n.
* Vireo modestus Baird.
* Vireo altiloquus Gray. n.
* Mimus orpheus Baird. n.
  Phonipara Marchii Baird.
  Loxigilla anoxantha Sclat.
  Loxigilla violacea Sclat.
* Certhiola flaveola Sund.
* Coturniculus tixicrus Gosse. n.
* Icterus leucopteryx Wagl. n.
  Quiscalus crassirostris Swains. n.
* Columba leucocephala Linn.
  Zenaida amabilis Bonap.
* Melopelia leucoptera Linn.
  Chamæpelia passerina Swains.
  Ortyx virginianus Bon.

BIRDS OF MEXICO AND LOWER CALIFORNIA.

* Pitangus Derbianus Sclat. n.
* Turdus Grayi Bonap. n.
* Campylorhynchus affinis Xantus. n.
* Cardinalis igneus Baird. n.

* Volatinia jacarina Cab.
* Harporhynchus cinereus Xantus. n.
* Zonotrichia melanotis. n.
* Cyanospiza Leclancheri. n.
* Spermophila torqueola Sclat.
* Icterus pustulatus Wagl. n.
* Cassiculus melanicteris Swains. n.
* Pipilo albigula Baird. n.
* Todirostrum sp. indet. Tabaxo. n.

TROCHILIDÆ.

Ramphodon nævius Cab. & Hein. n.
Glaucis hirsuta Gould. n.
Glaucis mazeppa Reich. n.
Phæthornis eurynome Gould. n.
Pygmornis eremita Gould. n.
Pygmornis rufiventris Gould. n.
Eupetomena macroura Gould. n.
Sphenoproctus pampa Gould. n.
Campylopterus hemileucurus Cab. & Hein. n.
Aphantochroa cirrhochloris Cab. & Hein. n.
Lampornis mango Cab. & Hein. n.
Lampornis gramineus Cab. & Hein. n.
Eulampis jugularis Cab. & Hein. n.
Eulampis holosericeus Bonap. n.
Aithurus polytmus Gould. n.
Thalurania glaucopis Bonap. n.
Thalurania furcata Bonap. n.
Florisuga mellivora Bonap. n.
Florisuga fusca Cab. & Hein. n.
Lophornis ornatus Gould. n.
Lophornis magnifica Bonap. n.
Lophornis chalybea Gould. n.
Gouldia Langsdorffii Bonap. n.
* Trochilus colubris Linn. n. e.
Mellisuga minima Bonap. n.
Calypte Costæ Gould. n.
Calypte Anna Gould. n.
Selasphorus platycercus Bonap. n.
Calothorax lucifer Gray. n.
Chætocercus Mulsantii C. & Hein. n.
Chætocercus Rosæ G. R. Gray. n.
Calliphlox amethystina Gould. n.
Pterophanes Temminckii C. & H. n.
Aglæactis cupripennis Sclat. n.
Rhamphomicrus Stanleyi Sclat. n.
Metallura tyrianthina Reich. n.
Avocettula recurvirostris Bonap. n.
Chrysolampis moschitus Boie. n.
Orthorhynchus exilis Reich. n.
Cephalolepis Delalandii Sclat. n.
Clais Guimetii Sclat. n.
Augastes superbus Bonap. n.
Petasophora serrirostris Gray. n.
Petasophora anais Gould. n.
Polytmus viridissimus Gould. n.
Patagona gigas Gould. n.
Heliangelus clarissæ Cab. & Hein. n.
Clytolæma rubinea Gould. n.
Eriocnemis vestita Bonap. n.
Eriocnemis Alinæ Cab. & Hein. n.
Eriocnemis Luciani Gould. n.
Leucochloris albicollis Reich.
Agyrtria niveipectus Cab. & Hien. n.
Agyrtria Milleri Cab. & Hein. n.
Agyrtria brevirostris Cab. & Hein. n.
Agyrtria albiventris Cab. & Hein. n.
Agyrtria maculata Cab. & Hein. n.
Amazilia beryllina Gould. n.
Eucephala cyanogenys Gould. n.
Chlorostilbon phaethon C. & Hein. n
Chlorostilbon prasinus Gould. n.

MISCELLANEOUS.

* Cacicus cristatus Gmel. n.
* Rhynchotus rufescens Wagl.
* Rhea americana Lath.
* Struthio camelus Linn.
* Dromaius Novæ-Hollandiæ Vieill.
Spheneæcus gramineus Gould. n.
* Gallinula phœnicura Penn.
* Ploceus philippinensis Linn. n.
* Ploceus ocularis Smith. n.
* Ploceus baya Blyth? n.
Orthotomus longicauda Strickl. n.
Nectarinia metallica Licht.? n.
Fiscus collaris Linn. n.
* Collocalia nidificans Lath. n.

The Curatorship of Reptiles was left vacant early in the year by Dr. Wilder's acceptance of a Professorship in Cornell University; the Curator subsequently chosen in his place leaving for the south soon after his election, has only just returned. He reports the collection to be in excellent condition, but poorly represented even in our own reptiles; much labelling remains to be done, and the proper identification of the species is not completed. The Curator proposes to supply temporarily some deficiencies in the representation of the Massachusetts species, from the unlabelled specimens laid aside for anatomical purposes. He will also revise the whole collection with care, and have skeletons prepared from the duplicates to illustrate the bony framework of at least each family. The collection has been rearranged in the new gallery devoted to it, and although not fully prepared for public inspection, has been on exhibition for the first time during the past week.

In the new room devoted to Fishes, and recently opened to the public, the specimens have been reassorted in glass jars and arranged in extended faunal divisions: thus, the species from the fresh waters of North America, east of the Rocky Mountains, form one collection; the marine fishes of the Atlantic shores, north of Cape Hatteras a second; those from the south of Cape Hatteras to Brazil a third, and the species of the Hawaiian Islands a fourth. The collection contains more than one thousand numbers, which have all been entered in the catalogue, and in many instances the species identified and recorded under their proper names; but although the collection is in a safe and accessible condition, it cannot be considered in proper order until every jar shall have its label for the information of visitors. It will require more time than the Curator can afford to identify and name all the specimens; and, unless some special arrangement can be made, this work must necessarily proceed very slowly. The collection is very deficient in the sea fishes of our neighborhood, and a large outlay would be necessary to complete it.

In the Entomological department Mr. P. S. Sprague has spent much time upon the Carabidæ, and we are indebted to Dr. LeConte, Dr. Horn and others, for identifying many species sent to them. Rev. Mr. Trask, Mr. Stebbins and Miss Sanborn have also assisted in various ways, both in this and in other departments. Mr. Sanborn has rearranged the Hemiptera of the Harris collection in the new cabinets, a few additional trays of specimens have been placed on exhibition, and about two thousand butterflies from Central America spread, and thus made available for exchange. Much attention has been given to the preservation of the collections, which, although not yet in the most desirable condition, are greatly in advance of their state a year ago. Most of the additions to this department have been made in small quantities by many persons. Some interesting East Indian Lepidoptera have been received in exchange from Mr. A. S. Bickmore, and Dr. C. F. Waters has constantly added new objects from our own vicinity.

The lower Articulates remain in good condition. A number of species of Cancroids and Grapsoids, sent to Mr. S. I. Smith of New Haven, for study, have been carefully labelled and returned; the Astaci have also passed through the hands of Dr. Hagen of Cambridge. Thirty-six specimens of fifteen species of Crustacea, from various parts of America, have been received, in exchange, from the Museum of Yale College.

A portion of the new room devoted to the department of Mollusks, has been placed in order and opened to the public. In the month of January an arrangement was made with the Curator to devote one half of the year to the collections under his charge; in consequence, more than one thousand tablets have already been arranged and placed on exhibition. The Curator's entire attention has been given to the Pratt collection, and its arrangement will be completed before he proceeds to other work. From what he has seen of the Soci-

ety's old collection, he regrets to state that it is even in worse condition than he had supposed. Nearly all the type specimens of Mighels, Gould, and others are missing; very many tablets are empty, while specimens are not infrequently misplaced.

When a newly-appointed Curator finds his collection in a disorganized condition, much time must be spent in preliminary work; this was the case with the last Curator, and although he gave two consecutive months of attention to the collection, it did not suffice to restore anything like order. The subsequent removal of the specimens to their new room, required a repetition of much of the old labor. With the exception of the work done by the last incumbent, there is no evidence of any attention bestowed upon the specimens for the last fifteen years, during which time the Curator has been familiar with the collection; it is now in a worse condition than it was years ago, showing, that in this case, gratuitous aid has proved a failure; and any one who has passed his evenings and holidays in arranging a small private cabinet will appreciate the amount of time which an extensive public collection will require, where all the groups must receive impartial attention, and new donations be placed upon exhibition at the earliest moment.

The Curator considers the upright wall cases in which the shells are arranged as entirely unsuitable for the display of the dry collection; the very nature of such objects requires their exhibition in horizontal cases, where they may be seen from above. He knows of but one other museum in the country where an upright arrangement is adopted, and there only from lack of room,—to be remedied at the earliest possible moment.

The Society is indebted to Dr. J. W. Newcomb and Mr. R. E. C. Stearns for assistance they have rendered in identifying and labelling Mollusks from the Hawaiian Islands and the west coast of America. An effort will be made during the coming year to complete the collection of Massachusetts

Mollusks, and the Curator solicits material for this purpose. The collection lacks all the smaller species, whether from land, sea, or river.

Nearly five hundred species of Mollusks from various localities determined by the late Mr. Cuming, have been presented by the Smithsonian Institution; a valuable donation of fifty-one species of deep-water Mollusks from our own coast, has been received from Mr. E. R. Mayo, and ninety-seven specimens of thirty-three Florida Mollusks from Mr. R. E. C. Stearns.

The collection of Radiates has not been greatly increased during the year; the most important additions are a small collection of starfishes from California, presented by Mr. R. E. C. Stearns, and a series of typical specimens of corals and echinoderms, mostly of species described by the Curator and sent by the Museum of Yale College, in exchange.

A number of Echini have been borrowed by Mr. Alexander Agassiz for monographic work, and the condition of the collection is generally satisfactory. The Echinoderms are all identified and catalogued, although the final labels remain unwritten; the corals have been mostly identified, and about half catalogued; the collection would be improved if all the corals were mounted in their natural position, and attention will be given to this point during the year. The Curator begs leave to state that numerous species of Radiates on our own coast, especially among the Hydroids, Ophiurans, and small starfishes still remain unrepresented.

The specimens in the department of Microscopy are in good condition; there is much rough material in the Bailey Collection ready at any time to be made use of by those interested in diatoms.

Little has been done to the Palæontological collections; nearly all the specimens are still mounted on the old plaster trays, which do not form an agreeable contrast to the new tablets and

labels of the neighboring departments. The Trenton Limestone fossils have, however, been newly mounted and relabelled with the old names. The collection, even in its present meagre representation of past epochs, requires the attention of one person for several months in the year to revise the nomenclature, and relabel and catalogue the specimens. The most important addition consists of a series of casts of twenty-eight species of fossils (mostly cretaceous) received from the Smithsonian Institution.

The department of Geology has been enriched by a collection of more than five hundred named specimens of rocks, purchased from Dr. Krantz of Bonn. The local collections of volcanic products are mostly labelled and arranged in cases, and the systematic collection of rocks has been rearranged. The economic collections have not increased to the extent hoped for by the Curator, and although architects and proprietors of quarries have promised specimens, none have been received during the year. A new case has been placed in the room, but the Curator deems the additional facilities of gallery cases needed for a proper display of the collection under his care.

The Curator of Mineralogy reports that he has rearranged nearly all the specimens in his department, in order to carry out his plan of having the collection correspond in system with that of the recent edition of Dana's Mineralogy. He has also adopted the new system of labelling introduced in other parts of the Museum, and the extent of his work can be estimated, from the fact that about two thousand seven hundred specimens are on exhibition. He expects to complete the task before another annual meeting. As usual, the department is indebted to Dr. C. T. Jackson for many valuable specimens.

I cannot trust myself to dwell on the loss which has befallen the Society in the sudden death of our Curator of Botany;

we cannot penetrate the mystery of his early decease, nor estimate the value of his counsel and the increasing importance of his aid. Mr. Mann's life was so rich in promise, his heart so full of generous impulse, his judgment so mature, that he was endeared to us all. We have looked in vain for his successor, and long shall we lament our loss. The collection remains as he left it, and but few additions have been received during the year.

This closes our review of the Society's operations for the past year. We would pass on to the next with better hope were we not encumbered by the embarrassments of which the Treasurer will shortly speak. For an institution like ours the expenditures of the past twelve months have certainly not been extravagant; all of them seem highly desirable, and we are forced to the conclusion that larger means are absolutely essential to our prosperity and growth. We have taken a high stand among Societies of a kindred nature in this country, but unless our income is nearly doubled we cannot retain it. Two things are urgently required,—more money and a larger staff of assistants; otherwise, in receiving such large additions as have been sent to us since our removal to the present site, without the corresponding monetary bequests, we shall be overwhelmed in the course of a few years by our own external prosperity.

LETTERS RECEIVED

DURING THE YEAR ENDING APRIL 30, 1869.

From the Académie Royale des Sciences, etc., de Belgique, Bruxelles, September 14th, 1867; Bibliotheca Universitatis Lugduno-Batavæ, October 22d, 1867; Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte te Rotterdam, October 23d, 1867; Bureau de la Recherche Géologique de la Suède, Stockholm, December 31st, 1867; Director of the Real Gymnasium und Ober-Realschule, St. Pölten, December, 1867; Office of the Geological Survey of India; Der Nassauischer Verein, Wiesbaden, January 6th, 1868; K. K. zoologisch-botanische Gesellschaft, Wien, January, 1868, and February, 1869; Madras Literary Society, March, 1868; Utrecht Society of Arts and Sciences, March, 1868; Smithsonian Institution, April 6th, June 26th, August 8th and December 12th, 1868; Massachusetts Horticultural Society, June 1st and June 26th, 1868; Royal Society of London, April 20th, 1868; Naturforschende Gesellschaft, Freiburg, May 3d, 1868; Société des sciences physiques et naturelles du Département d'Ille et Vilaine, Rennes, May 27th, 1868; Museum at Bergen, May 28th and October 10th, 1868; Essex Institute, Salem, Mass., May 29th, June 26th, August 5th, October 28th, November 24th, December 14th, 1868, January 16th, February 3d, March 12th and April 14th, 1869; Naturforschende Gesellschaft in Bern, May, 1868; Lyceum of Natural History, New York, June 1st and July 15th, 1868, February 8th, March 1st, April 6th and April 12th, 1869; Massachusetts Institute of Technology, June 2d and 23d, and August 13th, 1868, April 19th, 1869; Institute of Natural Science, Halifax, N. S., June 8th, 1868; New York State Agricultural Society, Albany, June 16th, 1868; Academy of Sciences of Chicago, June 18th, 1868, and April 29th, 1869; Massachusetts Historical Society, Boston, June 27th and Sept. 8th, 1868, and April, 1869; Public Library of the City of Boston, June 27th and December 10th, 1868; Schweizerische Gesellschaft, Bern, June, 1868; Amherst College Library, June, 1868; Regents of the University of the State of New York, Albany, July 3d, 1868; Corporation of Harvard College, Cambridge, July 20th, 1868, and April 6th, 1869; Linnean Society, London, July 22d, 1868; Société Hollandaise des Sciences à Harlem, September 11th, 1868; Société Royale des Sciences à Upsal, September 15th, 1868: Cercle Artistique, Littéraire et Scientifique d'Anvers, September 26th, 1868; Académie Royale des Sciences à Amsterdam, October 13th, 1868; Naturforschende Gesellschaft des Osterlandes zu Altenburg, October 15th, 1868; Corporation of Williams College, Williamstown, October 20th, 1868, and April 20th, 1869; the Natural History and Medical Reunion at Heidelberg, October 21st, 1868; Physikalisch-medizinische Gesellschaft in Würzburg, October 24th, 1868; Gesellschaft zür Beförderung der Naturwissenschaften zu Freiburg i. B., October 24th, 1868; Naturforschende Gesellschaft, Basel, October 30th, 1868; Museum of Comparative Zoölogy, Cambridge, November 13th, 1868,

March 8th and April 9th, 1869; American Philosophical Society, Philadelphia, November 13th, 1868 and March 8th, 1869; Institut National Genevois, Genève, November 14th, 1868; Finska Läkare-Sällskapet, Helsingfors, November 15th, 1867; Zoölogical Society of London, November 10th, 1868; Prof. A. de Bary, Director of the Botanical Garden of the University of Halle, November 10th, 1868; Royal Institution, London, November 18th, 1868; Editors of the Neues Jahrbuch für Mineralogie, Stuttgart, November 4th, 1868; Literary and Philosophical Society of Manchester, November 11th, 1868; K. K. Centralanstalt für Meteorologie und Erdmagnetismus in Wien, November 26th, 1868; Belfast Natural History, etc., Society, December 4th, 1868; Royal Horticultural Society, London, January, 1869; Royal Society of Edinburgh, January 5th, 1869; Anthropological Society of London, January 20th, 1869; Naturforschende Gesellschaft, Görlitz, January 27th, 1869; Naturforschender Verein, Dessau, January, 1869; Portland Society of Natural History, April 6th, 17th and 30th, 1869; American Antiquarian Society, Worcester, Mass., April 6th, 1869, acknowledging the receipt of the Society's publications.

From the K. preussische Akademie der Wissenschaften, Berlin, December 31st, 1867; Bureau de la Recherche Géologique de la Suède, December 31st, 1867, and June 15th, 1868; Manchester Scientific Students' Association, 1868; Nassauischer Verein für Naturkunde, Wiesbaden, January 6th, 1868; Superintendent of the Geological Survey of India, Calcutta, January 8th, 1868: Verein für siebenbürgische Landeskunde, January 24th, 1868; Naturhistorische Gesellschaft zu Hannover, February 2d, 1868; Société Entomologique des Pays-Bas, Leide, February 12th, 1868; Naturforschender Verein zu Riga, February 13th, 1868; K. K. zoologisch-botanische Gesellschaft, Wien, February 25th, 1868; Utrecht Society of Arts and Sciences, March, 1868; Académie Impériale des Sciences, Belles-Lettres, etc., de Lyon, April 10th, 1868; Universidad de Chile, April 15th, 1868; K. Akademie der Wissenschaften, Wien, April 23d and August 26th, 1868; Société Entomologique de France, Paris, April 25th, 1868; Oberhessische Gesellschaft für Natur- und Heilkunde, April 27th, 1868; Académie Royale des Sciences, etc., Bruxelles, April 27th, 1868; K. böhmische Gesellschaft der Wissenschaften, May 14th, 1868; Société Hollandaise des Sciences, Harlem, May 20th, 1868; Batavian Society, Rotterdam, May, 1868; Smithsonian Institution, Washington, D. C., June 1st, 1868; Société Impériale d'Agriculture de Moscou, June 1st, 1868; K. K. geographische Gesellschaft, Wien, June 30th, 1868; Naturforschende Gesellschaft in Bern, June, 1868; Schweizerische naturforschende Gesellschaft, Bern, June, 1868; Naturforscher-Verein zu Riga, July 13th, 1868; Académie Impériale des Sciences, Belles-Lettres, etc., Lyon, July 15th, 1868; Société Linnéene de Lyon, July 15th, 1868; W. Hunter, Acting Secretary of State, in behalf of A. Mazel, Minister from the Netherlands to the United States, August 8th, 1868; Société Royale des Sciences à Upsal, August 1st and September 15th, 1868; Schlesische Gesellschaft für vaterländische Cultur, Breslau, August 15th, 1868; Museum Francisco-Carolinum, Linz, August 19th, 1868; Académie Royale des Sciences à Amsterdam, September 2d, 1868; K. Leopoldino-Carolinische deutsche Academie der Naturforscher, Dresden, September, 1868; Naturhistorische Gesellschaft, Nürnberg, October 1st, 1868; Geological and

Polytechnic Society of the West Riding of Yorkshire, Leeds, October 16th, 1868; Wetterauische Gesellschaft für die gesammte Naturkunde zu Hanau, November 11th, 1868; Université Royale à Christiania, November, 1868; Mannheimer Verein für Naturkunde, November, 1868; K. Preussische Akademie der Wissenschaften, Berlin, December 28th, 1868; Medizinisch-naturwissenschaftliche Gesellschaft, zu Jena, January 29th, 1869; Prof. C. M. Von Siebold, Leipzig, February 15th, 1869; Belfast Natural History and Philosophical Society, February 17th, 1869, presenting their various publications.

From the Gesellschaft naturforschender Freunde zu Berlin, February 7th, 1868; Société d'Agriculture, etc., de la Sarthe, Le Mans, March 1st, 1868; Naturforschende Gesellschaft, Görlitz, March 8th, 1868; Naturforschende Gesellschaft in Danzig, June 2d, 1868; Société Impériale Géographique, St. Petersburg, July 13th, 1868; Royal Society of Northern Antiquaries, Copenhagen, September 1st, 1868; K. K. geologische Reichsanstalt, Wien, October 16th, 1868; Oberhessische Gesellschaft für Natur- und Heilkunde, Giessen, October 24th, 1868; Meklenburgischer patriotischer Verein, Rostock, October 25th, 1868; Société de Physique et d'Histoire Naturelle de Genève, November 1st, 1868; Die Pollichia, Dürkheim, November 20th, 1868; Société d'Histoire Naturelle de Strasbourg, December 10th, 1868; K. Gesellschaft der Wissenschaften zu Göttingen, January, 1869; Société Royale Linnéenne de Bruxelles, February 15th, 1869; Royal Physical Society of Edinburgh, March 8th, 1869; Edward Newman, Esq., London, Eng., March 11th, 1869; Société Linnéenne de Bordeaux, March 12th, 1869, acknowledging the receipt of the Society's publications, and presenting their own.

From the Geographical Society of Berlin, December 20th, 1868, acknowledging the receipt of the Society's publications, and accepting the proposition to exchange.

From the Oekonomische Gesellschaft, Dresden, April 8th, 1868, presenting its publications and accepting the offer of exchange.

From the K. Norske Universitet, December 7th, 1868, presenting publications and asking exchange.

From the Société Littéraire du Brabant Septentrional à Bois le Duc, November 17th, 1868; Ministère de la Marine et des Colonies, Paris, December 16th, 1868; Société des Sciences Physiques et Naturelles de Bordeaux, January 12th, 1869; Verein für vaterländische Naturkunde in Württemberg, Stuttgart, February 15th, 1869, acknowledging the receipt of the Society's publications, presenting their own, and asking that missing numbers of the Society's publications may be sent to them.

From the Bataafsch Genootschap der Proefondervindelijke Wijsbegeerte te Rotterdam, September 29th, 1868, acknowledging the receipt of the Society's publications, and offering to complete the set of its own publications in the possession of the Society.

From the Universitas Lugduno-Batava, September 14th, 1868; and from Señor Felipe Poey, Havana, September 19th, 1868, acknowledging the receipt of the Society's publications, and promising to supply deficiencies in the publications heretofore received by the Society from them.

From the Société des Sciences de Finlande, Helsingfors, November 30th, 1868,

and from the Schlesische Gesellschaft für vaterländische Cultur, Breslau, December 2d, 1868, acknowledging the receipt of the Society's publications, and regretting inability to supply deficiencies in the publications heretofore transmitted to the Society.

From the K. K. zoologisch-botanische Gesellschaft, Wien, November 23d, 1868, presenting its publications, regretting its inability to furnish publications asked for by the Society, and asking that missing numbers of the publications transmitted by the Society may be supplied.

From the K. K. zoologisch-botanische Gesellschaft, Wien, October 12th, 1867; Naturhistorischer Verein der preussischen Rheinlande und Westphalens, Bonn, March 1st, 1868; Verein für vaterländische Naturkunde in Württemberg, Stuttgart, April 12th, 1868; Superintendent of the Geological Survey of India, Calcutta, May 20th, 1869; Andrew Murray, Esq., London, November, 1868; Institut Impérial de France, Paris, December 5th, 1868; and the Société d'Agriculture, Sciences et Arts de la Sarthe, Le Mans, February 27th, 1869, acknowledging the receipt of the Society's publications, and asking that missing numbers may be supplied.

From the Société Entomologique de France, Paris, April 16th, 1869, acknowledging the receipt of the Society's publications, asking for missing numbers, and promising to complete the series of its publications in the possession of the Society so far as possible.

From the Société Linnéenne de Bordeaux, March 17th, 1869, asking that deficiencies in their series of the Society's publications may be supplied to them, and promising to reciprocate.

From the Royal Geographical Society, London, January 4th, 1869, presenting some of the back numbers of its publications.

From Dr. H. Loew, Meseritz, Prussia, February 28th, 1868; Prof. O. C. Marsh, New Haven, Conn., July 6th, 1868; Prof. William H. Brewer, New Haven, Conn., July 22d, 1868; Prof. T. Eulenstein, Dresden, Saxony, October 5th, 1868; Prof. Burt. G. Wilder, Cornell University, Ithaca, N. Y,, January 24th, 1869; Prof. Charles Wedl, Vienna, Austria, February 20th, 1869, in acknowledgment of their election as Corresponding Members.

From Dr. Christopher Kollock, Cheraw, N. C., June 22d and October 21st, 1868; Henry Davis, Money Creek, Minnesota, October 27th, 1868; and John W. M. Appleton, Waldingfield, W. Va., November 5th, 1868, offering specimens to the Society, etc.; A. A. Gautier, Chevalier de la Légion d'Honneur, Paris, September 30th, 1868, a circular concerning the cultivation of the Potato; Dr. C. A. Martius, München, December 15th, 1868, announcing the death of Dr. Carl Friedrich Philipp von Martius; Biological Department of the Academy of Natural Sciences, Philadelphia, February 25th, 1869, a circular concerning the objects of the department; the University of Vermont, Burlington, March 9th, 1869, in acknowledgment of having been placed on the list of Institutions to which the Society's publications are sent.

ADDITIONS TO THE LIBRARY

DURING THE YEAR ENDING APRIL 30, 1869.

A Guide to the Study of Insects. By A. S. Packard, Jr., M. D. Parts I–VI. 8vo. Salem, 1868–9. *From the Author.*

Annual Meteorological Synopsis for the year 1867. By J. B. Trembley, M. D., in the city of Toledo, Ohio. 8vo. Pamph. *From the Author.*

A System of Mineralogy. By James Dwight Dana, aided by George Jarvis Brush. 5th Edition. 8vo. New York, 1868. *From the Author.*

Queries on the Red Sandstone of Vermont, and its Relations to other Rocks. By the Rev. John B. Perry. 8vo. Pamph. Boston, 1868. *From the Author.*

Notes on certain Terrestrial Mollusca, with Descriptions of new Species. By Thomas Bland. 8vo. Pamph. New York, 1868. *From the Author.*

The Institutes of Medicine. By Martyn Paine, M. D. 8vo. New York, 1867. *From the Author.*

Contributions to the Mineralogy of Nova Scotia. By Professor How. III. 8vo. Pamph. 1868. *From the Author.*

Catalogue of the Phænogamous Plants of the United States east of the Mississippi, and of the Vascular Cryptogamous Plants of North America, north of Mexico. By Horace Mann. 8vo. Pamph. Boston, 1868. *From the Author.*

Mr. Meek's Notes on my Preliminary Report of the Geology of Kansas, as edited by Dr. Hayden. By Prof. G. C. Swallow. 8vo. Pamph. St. Louis, 1868. *From the Author.*

On some Cretaceous Fossil Plants from Nebraska. By Leo Lesquereux. 8vo. Pamph. Columbus, 1868. *From the Author.*

Céphalopodes Siluriens de la Bohême. Groupement des Orthocères. Par Joachim Barrande. 8vo. Pamph. Paris, 1868. *From the Author.*

Derivative Hypothesis of Life and Species. By Professor Owen. 8vo. Pamph. London, 1868. *From the Author.*

Capillar-Blut undefibrinirtes zur Transfusion. Von Dr. med. Franz Gesellius. 8vo. Pamph. St. Petersburg, 1868. *From the Author.*

Outlines of Comparative Anatomy and Medical Zoölogy. By Harrison Allen, M. D. 8vo. Philadelphia, 1869. *From the Author.*

Mutillarum novarum species aliquot. Auctore H. de Saussure. 8vo. Pamph. Paris, 1867. *From the Author.*

Notes on the later extinct Floras of North America. By J. S. Newberry. 8vo. Pamph. New York, 1867. *From the Author.*

The Pampas and Andes. A Thousand Miles' Walk across South America. By Nathaniel H. Bishop. 12mo. Boston, 1869. *From the Author.*

Action of Anæsthetics on the Blood Corpuscles. By J. H. McQuillen, M. D. 8vo. Pamph. Philadelphia, 1869. *From the Author.*

Introduction to Zoölogy. By Robert Patterson, F. R. S. 16mo. Belfast, 1866. *From the Author.*

On the Geology and Silver Ore of Wood's Location, Thunder Cape, Lake Superior. By Thos. Macfarlane. 8vo. Pamph. Actonvale, 1869. *From the Author.*

Die Vegetationsverhältnisse von Croatien. Von Dr. August Neilreich. 8vo. Wien, 1868. *From the Author.*

Die Zoophyten und Echinodermen des Adriatischen Meeres. Von Prof. Cam. Heller. 8vo. Pamph. Wien, 1868. *From the Author.*

On the Origin of Genera. By Edward D. Cope, A. M. 8vo. Pamph. Philadelphia, 1869. *From the Author.*

Flora Brasiliensis. Edidit Carolus Fridericus Philippus de Martius. Fasc 44–46. Folio. Lipsiae, 1868. *From Mrs. B. D. Greene.*

Annual Report of the Surgeon-General, United States Army. 8vo. Pamph. Washington, 1868. *From the Surgeon-General.*

California Wine, Wool and Stock Journal. J. Q. A. Warren, Editor. Vol. I. 4to. San Francisco, 1863. *From the Editor.*

Geological and Natural History Survey of North Carolina. Part III. Botany, by Rev. M. A. Curtis, D. D. 8vo. Raleigh, 1867. *From C. J. Sprague.*

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ADDITIONS TO THE MUSEUM

DURING THE YEAR ENDING APRIL 30, 1869.

Mammals and Comparative Anatomy. Skin of black-footed Kangaroo, collected by Capt. I. E. A. Todd at King George's Sound, Australia, by Mr. Nath. Wales. A large, white birch log, bearing marks of the teeth of the beaver, and samples of wood used by the beavers as food, etc., from Rangely Lake, Me., by Mr. Luther Hills. A specimen of *Vespertilio carolina* from Ashburnham, Mass., by Mrs. Addison Howe. Five house mice, *Hesperomys leucopus*, in alcohol, from Hart's Location, N. H., by Dr. S. A. Bemis. Cranium and Atlas of *Felis* from the Cape of Good Hope, by Dr. Edw. Gilchrist, U. S. N. A skeleton of Negress from Zanzibar, Africa, by Mr. Samuel V. Goodhue. Skull of an albatross, *Diomedea exulans*, from the South Atlantic, by Dr. G. F. Waters. An embryo spermophile from Arizona, by Capt. F. Dame. A young black bear, ♂, by Mr. Wm. T. Adams. Three fatty tumors from abdominal cavity of domestic fowl, by Mr. P. S. Sprague. A specimen of the star-nosed mole, *Condylura cristata*, from Brookline, by Mr. J. E. Cabot. A fine head with antlers of *Cervus virginianus*, ♂, from Northern Maine, by Messrs. C. D. and I. H. Presho. A young male Prong-horn, *Antilocapra americana*, by the City of Boston.

Birds. Twenty-five specimens of birds, most of them mounted, from Newtonville, by Mr. L. L Thaxter, being species needed to complete the Society's New England collection. A large number of birds' skins from Central and South America, by Mrs. Henry Bryant. Mounted specimen of a variety of Pigeon, *Columba livia*, bred in Cambridge, by Mr. Edw. D. Harris. A small bird skin from St. Domingo, by Mr. E. C. Ring. A bird from Hart's Location, N. H., by Dr. S. A. Bemis. A fresh specimen of Ruddy Duck, *Erismatura rubida*, ♀, from Halifax, Mass., by Mr. C. Cowing. Barred owl, *Syrnium nebulosum* from Auburndale, Mass., by Mr. Chas. O. Bouvé. Thirty-two birds' skins from Equatorial America, by Prof. James Orton. A mounted specimen of *Gallinula galeata* shot in Massachusetts, by Mr. E. A. Brigham. Skin of white-winged cross-bill, ♀, *Curvirostra leucoptera*, from Cambridge, by Mr. W. W. Dodge. A Pine Grosbeak, ♀, *Pinicola canadensis*, from Brookline, by Mr. J. E. Cabot. An owl, fresh, from North Brookfield, by Mr. Sam. Mixter. Eighty specimens of seventy-six species of birds' skins, determined by Mr. Geo. N. Lawrence, from Costa Rica and vicinity, by the Smithsonian Institution. A young, unfledged owl, *Bubo virginianus*, from Brookline, by Mr. Arthur Smith.

Birds' Nests and Eggs. Ninety-seven specimens of seventy-two species of birds' nests and one hundred and forty-five specimens of fifty-seven species of eggs from various parts of North America, selected by Dr. T. M. Brewer with a view to complete the Society's collection, by the Smithsonian Institution. Seventy species of North American eggs, represented by fifteen hundred and ninety-eight specimens, collected by Dr. Henry Bryant, by Mrs. Bryant. Twelve specimens of six species of eggs, by exchange with Mr. C. M. Jones, North Madison, Ct. Egg laid by ♀ canary paired with ♂ linnet, by Mr. J. Baird. Eighteen nests of birds containing eggs collected by Geo. Welch of Lynn, eighty-three specimens of forty-six species of European birds' eggs, and nest of *Eriocnemis Luciani* from the eastern slope of Pichincha, S. A., collected by Dr. E. Coues, by Dr. T. M. Brewer.

Reptiles. Eggs of the black snake, *Bascanion constrictor*, from Lexington, by Mr. Chas. A. Wellington. Ten specimens of salamanders, in alcohol, by Mr. F. G. Sanborn. Four saurians from Madeira, by Dr. Francis H. Brown. Five reptiles from Texas, by Mr. C. P. Dillaway. Two snakes in alcohol, from Baltimore, by Mrs. R. A. and E. M. Howard. Box-tortoise, *Cistudo carolina*, from North Wrentham, Mass., by Miss Abbie H. C. Hills. Rattlesnake, *Crotalus durissus*, from Milton, Mass., by Mr. Arthur Sias. A specimen of *Diadophis punctatus* from Phillips, Me., by Mr. Luther Hills. Three saurians from Arizona, by Capt. F. Dame. An *Anolius carolinus* with bifurcation of the posterior extremity, from South Carolina, by Dr. Geo. F. Waters.

Fishes. A sword of the sword-fish, *Xiphias gladius*, by Dr. H. I. Bowditch. Twenty-two fishes from Madeira, by Dr. Francis H. Brown. Two fishes belonging to the genus *Ostracion* from the Bahamas, by Mr. Otto Cuntz. One *Remora* from the Gulf of Mexico, by Mr. C. P. Dillaway. A Harpoon float made from the stomach of the Black-fish, by Capt. N. E. Atwood. A *Sygnathus* in alcohol, from Cohasset, by Dr. S. Kneeland. The sixth spine of the dorsal fin of a sword-fish, *Histiophorus* sp., obtained forty miles west of Cape St. Lucas, by Mr. Caleb Howland, with a pencil sketch of the animal, by Mr. H. F. Copeland. A mass of eggs of *Cyclopterus lumpus*, by Mr. D. F. Carlton. A plank of southern pine perforated by, and containing a portion of, the sword of the sword-fish, *Histiophorus*, from the side of ship Pocahontas, by the owners, Messrs. Foster, Waterman & Co. Specimens of *Amblyopsis* from Mammoth Cave, Ky., by Mr. S. H. Scudder. A small fish, said to have been taken from the stomach of a dolphin, on the passage of the Brig Abby, Capt. W. H. Lewis, from Cienfuegos to Boston, by Capt. H. Merrill.

Insects. Several insects from Mexico, and two species of butterflies from the Philippine Islands, by Dr. S. Kneeland. A prepared section of the pupa of *Samia Cecropia* and two specimens of *Mitremyces cinnabarinum* from Medford, by Mr. F. G. Sanborn. Twenty-five insects and myriapods from Madeira, by Dr. Francis H. Brown. A living specimen of *Mygale fasciata* from Calcutta, by Mr. Wm. E. Baker. Ten species of Insects from Texas, by Mr. C. P. Dilla-

way. Three hundred and ninety-five mounted specimens of various orders of insects from Texas, by exchange with Mr. G. A. Belfrage. Two living specimens of the "Colorado Potato beetle," *Doryphora decemlineata* from Laporte, Ind., by Mr. W. O. Ross. A hymenopterous insect from Boston, by Mr. R. C. Greenleaf. About seventy-five specimens of insects and larvæ in alcohol, from North Wrentham, Mass., by Mr. Luther Hills. Seventy-five specimens of *Cicada septendecim* from Baltimore, by Dr. C. D. Homans. One hundred and eighteen European Coleoptera in alcohol, and one hundred and fifty insects also alcoholic, from Barnstable, Mass., by Mr. T. W. Thacher. Over three hundred alcoholic specimens of insects from Springfield, Mass., by Mr. Solomon Stebbins. Forty-five alcoholic specimens of insects from Lexington, by Mr. Chas. A. Wellington. Twenty-eight alcoholic specimens of insects from West Newton, by Mr. Henry A. Purdie. Twenty-one larvæ of Lepidoptera from South Dedham, by Mr. Nelson B. White. One larva of a Lepidopteron from Charlestown, by Mr. Stillman Holt. One lepidopterous larva from Andover, by Mr. A. C. Locke. Two specimens of *Cicada septendecim* from Ohio, by Dr. J. E. Tyler. *Diapheromera femorata* from Jamaica Plain, by Mr. Isaac H. Cary. *Diapheromera femorata* from vicinity, by Mr. H. Blanchard. Alcoholic specimen of *Spirobolus marginatus* and thirty-eight specimens of insects, from Waldingfield, Kanawha Co., West Va., by Maj. J. W. M. Appleton. Sixty-four mounted specimens of insects from South America, by Dr. B. S. Shaw. Alcoholic specimen of *Epeira fasciata* and egg sac from Hampton Falls, N. H., by Miss Francis Dow. Nest of *Mygale Girardii* from California, by Mr. R. E. C. Stearns. Cells containing young of the "yellow jacket" wasp, *Vespa germanica*, from China, Me., by Mr. J. McKay. A fine specimen of the golden nut-weevil, *Balaninus Sayi* from Woburn, by Mr. J. G. Shute. *Diapheromera femorata*, ♂, from Malden, by Mr. John K. Abbott. A dry specimen of *Mygale* from St. Domingo, by Mr. E. C. Ring. A number of insects from Hart's Location, N. H., by Dr. S. A. Bemis. *Diapheromera femorata*, ♀, from Suncook, N. H., by Dr. Hildreth. Over three hundred specimens, illustrating various facts in insect economy, from the West Indies, Southern States and New England, seventy-five Lepidoptera from the Isle of Pines, and seven from India, by Mr. S. H. Scudder. A large number of fine specimens of insects pinned, and others in alcohol from Walpole, by Miss Clarissa Guild. Several singular cylindrical galls from Holly Springs, Miss., by Dr. Arnold. Five Arachnidæ, four Myriapoda and two specimens of *Stenopelmatus talpa* from Arizona, by Capt. F. Dame. Cocoon of *Platysamia Cecropia* from Dedham, by Mr. Geo. F. Fisher. Ten finely mounted specimens of insects from Cambridge, by Mr. S. Lockwood. Two living specimens of *Belostoma Haldemanum* from Jamaica Plain, by Mr. C. F. Smith. Large dry specimen of *Tropidacris dux* from South America, by Miss Whitwell. Nine specimens of five species of *Crambus*, from Beverly, determined by Prof. Zeller, by Mr. Edward Burgess. A pair of *Boreus brumalis* in alcohol, from Medford, by Dr. E. P. Colby. A pair of *Chrysophora chrysochroa* from Napo River, S. A., by Prof. James Orton. Sixteen specimens of *Brephos infans* and two abnormal cocoons of Saturnians, from Jamaica Plain, by Mr. C. S. Minot. Several galls of *Cynips quercus-ficus*, cocoons of *Callosamia Promethea*, cluster of eggs of *Clisiocampa sylvatica*, one hundred and sixty

specimens of insects in different stages, and over a hundred specimens of cocoons, galls and other illustrations of insect economy from Newton Corner, by Dr. Geo. F. Waters.

Crustacea and Worms. Several crustacea from Mexico, by Dr. S. Kneeland. Twenty crustacea from Madeira, by Dr. Francis H. Brown. Three crustacea from Texas, by Mr. C. P. Dillaway. Large claw of Lobster, *Homarus americanus*, from vicinity, the animal weighing twenty-five pounds, by Dr. B. Joy Jeffries. Two specimens of *Pycnogonum* from the Bay of Fundy, by Mr. L. L. Thaxter. Thirty-six specimens, representing fifteen species of crustacea, from North, Central and South America, by exchange with the Museum of Yale College, New Haven, Ct. An entozoon from the domestic fowl, by Dr. Geo. F. Waters. A ♀ *Astacus* with its young, and *Astacus* from the Mammoth Cave, Ky., by Mr. S. H. Scudder. A small crab in alcohol, from St. Augustine's, Fla., by Mr. E. Samuels.

Shells. A number of shells by Dr. H. I. Bowditch. Several mollusca from Mexico, by Dr. S. Kneeland. About two hundred Mollusca from Madeira, by Dr. Francis H. Brown. Two specimens of *Caprella* from the Bay of Fundy, by Mr. L. L. Thaxter. Pearly concretions found in oysters, by Dr. S. Kneeland. Four hundred and fifty species of shells of mollusca from various localities, determined by Hugh Cuming, by the Smithsonian Institution. Sixty specimens of fresh water mollusca from Waterville, Me., by Dr. Geo. F. Waters. Two specimens of *Platyodon cancellatum* from California, and ninety-seven specimens of shells of thirty-three species of mollusca, from the Atlantic Coast near Florida, by Mr. R. E. C. Stearns. A number of shells of mollusca from the deep sea Atlantic, by Mr. E. R. Mayo.

Radiates, Sponges, etc. Flower-basket Sponges, *Euplectella speciosa*, from the Philippine Islands, four specimens, two of which contained Crustacea, by Mr. H. U. Jeffries, and one specimen by Capt. H. P. Snow. A large "Portuguese Man o'War," *Physalia*, from the coast of Texas, by Mr. C. P. Dillaway. Three specimens of *Asterina miniata* from California, and three specimens of *Mellita quinquepora* from Amelia Island, Fla., by Mr. R. E. C. Stearns. A *Madrepora*, by Mr. D. F. Carlton.

Botany. Several specimens of twigs and leaves of the Red Cedar, *Juniperus virginiana*, with its parasitic fungus, *Podisoma juniperi*, by Mr. Luther Hills. Leaves of *Quercus pedunculatus* from Madeira, and a ruler illustrating various woods of Madeira, by Dr. Francis H. Brown. Sixty-five specimens of dried plants, fibrous vegetable material and samples of wood from Africa, by the Massachusetts Horticultural Society. Dry specimens of fungi from Hart's Location, N. H., by Dr. S. A. Bemis. Two specimens of *Lycopodium lepidodendron* from Texas, by Dr. Edw. Gilchrist, U. S. N. Twelve specimens of two species of grasses from the Philippine Islands, by Dr. S. Kneeland. A pod of *Theobroma cacao* from Cuba, and a specimen of *Cordyceps entomorhiza* on larva of a *Lachnosterna*, by Mr. S. H. Scudder. Three woody tumors, or

"wood-pearls," from the Maple, by Mr. Samuel Berry, Porter, Me. Several specimens of fruits and seed-vessels, by Mr. D. F. Carlton. Nine specimens of plants from vicinity of Boston, and three specimens of *Polyporus* on willow from Newton, by Dr. G. F. Waters. Twelve specimens of cones and leaves of four species of *Coniferae* from the Pacific Coast, and leaves and cones of two species of pines, *P. tæda* and *P. palustris*, from Florida, by Mr. R. E. C. Stearns.

Microscopy. Slide containing skin of Sole, by Mr. Chas. Stodder. Slide containing infusorial earth from Monmouth, Me., by Mr. Edward Bicknell. A mass of infusorial earth from Nevada, by Mr. R. E. C. Stearns. Slide containing specimen of *Aulacodiscus oreganus* by Mr. E. Samuels.

Palæontology. Fossils from Cincinnati, Ohio, by Miss Kyle. Shell incrustations from Hawkinsville, Fla., by Mr. Geo. A. Boardman. Two fossil shells from Madeira, by Dr. Francis H. Brown. Thirty specimens of fossil echinoderms from the Chalk Cliffs of Dover, Eng., by Mr. Luther Hills. One hundred and thirty-two specimens of fossils from Decorah, Iowa, by Mr. Henry Davis. A fossil *Buccinum* from Labrador, by Mr. S. H. Scudder. Seven fossil shark's teeth from Holly Springs, Miss., by Dr. Arnold. Specimen of fossil coral and coal-plant from Neuse River, N. C., by Dr. N. H. Talbot. Casts of twenty-eight species of fossil mollusca and crustacea, by the Smithsonian Institution, through Mr. W. H. Dall. Four specimens of fossil coral and chalcedony from Florida, by Mr. R. E. C. Stearns.

Geology. Over one hundred specimens of rocks and minerals, by Dr. H. I. Bowditch. Three specimens of Lime rock from Madeira, by Dr. Francis H. Brown. Four specimens of Porphyry and "Green horn-stone," from Melrose, by Mr. Wm. B. Shedd. Ten specimens of manufactured stone, by Messrs. McLean Bro's. A "Pot-hole" and eight specimens of rocks from Maine, by Mr. Luther Hills. Sixteen specimens of rocks from Rangely Lake, Me., by Mr. Geo. L. Vose, illustrating his paper in Vol. I, Part IV, of the Memoirs of the Society. Basaltic column from the "Giant's Causeway," Ireland, and a wooden model of the Causeway, by Dr. W. W. Morland. A specimen of birch wood found twelve feet below the surface of an ancient landslide on the Presumpscot River, Me., by Mr. E. S. Morse. Thirty-three specimens of stalagmites and stalactites from Fountain Cave, Missouri, by Mr. C. S. Lynch. Petrosilex and green stone porphyry from Cohasset, by Mr. W. S. Balch through Dr. C. T. Jackson.

Mineralogy. Over one hundred specimens of minerals and rocks, by Dr. H. I. Bowditch. Two specimens of Graphite from Ticonderoga, N. Y., by Mr. Michael Snow. Twenty-six specimens of minerals from Rideau Lake, C. W., by Dr. C. T. Jackson. A specimen of specular iron ore from Lubec, Me., by Mr. C. Stillwell. A cut glass cruet-stopper with its central cavity partly filled with water from a recent fire in Boston, by Mr. Thomas Gaffield.

Mr. Edward Pickering presented the following report of the Treasurer for the past year: —

REPORT OF E. PICKERING, TREASURER,

ON THE

FINANCIAL AFFAIRS OF THE SOCIETY,

For the year ending April 30, 1869.

The Receipts and Expenditures for the year have been as follows :

Receipts.			
Dividends and Interest			$8,480.40
Courtis Fund Income			600.00
Pratt " "			585.00
Wolcott " "			799.49
Walker " " (one half.)			1,233.15
Annual Assessments			1,340.00
Admission Fees			130.00
Life Membership			100.00
Profit on sales of Stock			43.00
Total			$13,311.04
Expenditures.			
Museum Building and Furniture		$694.95	
Cabinet		1,417.71	
Library		279.97	
Memoirs and Publications	$7270.16		
Less receipts	1491.90		
		5,778.26	
Gas		168.29	
Fuel		439.75	
Repairs of Building		483.49	
Binding		1,674.06	
Lectures	$713.88		
Less receipts	204.00		
		509.88	
Faunal Map		418.15	
Smithsonian Institute Explorations		300.00	
Salaries and wages		6,156.85	
Insurance		375.00	
General Expenses		943.25	$19,639.61
Excess of Expenditures over Receipts			$6,328.57

The following is a statement of the Property of the Society, exclusive of the Cabinet and Library, which are not susceptible of a definite valuation.

Museum Building.			
Cost of Building and Furniture, per last Report		$136,030.19	
Expended during the year		694.95	
			$136,725.14
Bulfinch St. Estate Fund.			
Note secured by mortgage		$15,000.00	
84 Shares Tremont National Bank		10,122.00	
Cash		142.45	
			25,264.45
Courtis Fund.			
50 Shares Globe National Bank		$6,250.00	
35 Shares Philadelphia, Wilmington & Balt. R.R. Co.		1,827.50	
$400 U. S. 5-20 Bonds		425.00	
			8,502.50
Walker Fund.			
Notes secured by mortgage		$41,105.00	
26 Shares Tremont National Bank		3,133.00	
19 " Atlas " "		2,204.00	
Cash		797.49	
			47,239.49
H. F. Wolcott Fund.			
$6,000 Chicago and N. Western R.R. Co. 10's Bonds			6,000.00
S. P. Pratt Fund.			
27 Shares Philadelphia, Wilmington & Balt. R.R. Co.		$1,407.63	
50 " Norwich & Worcester R.R. Co.		5,212.75	
10 " Webster National Bank		1,072.75	
6 " Boston " "		657.25	
Cash		121.94	
			8,472.32
General Fund.			
17 Shares Bates Manufacturing Co.		$2,040.00	
35 " Everett Mills		4,900.00	
30 " Hamilton Woolen Manuf. Co.		8,550.00	
1 " Lawrence Manuf. Co.		800.00	
80 " Washington Mills		9,600.00	
114 " Vermont and Canada R.R. Co.		11,400.00	
12 " Cocheco Manuf. Co.		7,200.00	
2 " Lowell Manuf. Co.		1,800.00	
4 " Laconia Manuf. Co.		4,400.00	
3 " Pepperell Manuf. Co.		3,000.00	
11 " Neptune Ins. Co.		1,760.00	
18 " Boston Ins. Co.		2,160.00	
$4,000 Vermont Cent. & Vermont & Canada R.R. Co.'s Bonds		4,290.00	
$10,000 Albany City Bonds		9,350.00	
$1,000 Chicago & N. Western R. R. Co.'s Bonds		1,000.00	
95 Shares Michigan Central R.R. Co.		10,963.00	
50 " Ogdensb'g & Lake Champlain R.R. Pref. Stks.		5,162.75	
38 " Philadelphia, Wilmington & Balt. R.R. Co.		1,976.25	
20 " National Bank of Redemption		2,465.25	
			92,817.25
Miscellaneous.			
Unsettled Accounts	$24.43		
Cash	2,544.14		
		$2,568.57	
Less outstanding bills		177.86	2,390.71
Total value of Property April 30, 1869			$327,411.86
" " " 30, 1868			$340,710.79
Diminution of value the past year			$13,298.93

This apparent diminution is occasioned principally by a reduction to the amount of $9,356.00 in the estimated value of the manufacturing and insurance stocks received under the Walker bequest, by the expense of binding the pamphlets and periodicals which have accumulated for several years, and by the unusually large cost of the publications, including the Harris Correspondence, etc. The publication of this work, of which three hundred copies are still undisposed of, was authorized nearly six years ago by the Council, and has cost about $2,000. We receive in exchange for our Memoirs and Proceedings, the publications of Foreign Scientific Societies; and in this way the value of the library has been increased during the past year by the sum of, at least, five thousand dollars.

It should be observed that a large portion of the income of the Society cannot be applied to general purposes. One half of the income of the Walker Fund is not received by the Treasurer, or included in the above receipts, but is reserved as a prize fund for essays on subjects relating to Natural History, and for other special purposes. The income of the Wolcott Fund can only be used in the purchase of books; and that of the Pratt Fund is applicable only to the Conchological Department. Under an order of the Council, the Bulfinch Street Estate Fund, with its accruing income, is to constitute an accumulating Building Fund, and for this reason, such income also is not included in the receipts of the Treasurer.

All which is respectfully submitted,

E. Pickering,

Treasurer of the Boston Society of Natural History.

Boston, *April* 30, 1869.

Mr. T. T. Bouvé, on behalf of the Trustees, presented the following report on the Trust Funds of the Society for the past year: —

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE COURTIS FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. CR.

Date	Dr.	Amount	Date	Cr.	Amount
1868. Sept. 26.	To Cash received for Interest on $10,000 St. Louis Bonds	$300.00	1868. Sept. 26.	By Cash paid to Edw. Pickering, Treasurer,	$300.00
1869. March.	" received for Interest on $10,000 St. Louis Bonds	300.00	1869. March 26.	" " " "	300.00
April.	" received for $10,000 St. Louis Bonds sold at $81 (it being thought best by the Trustees to invest in property not so readily transferable by delivery only, and less likely to cause loss by robbery)	8,100.00	April.	" paid for Stock, as follows:	
				" 50 Shares Globe Bank, at 125	6,250.00
				" 35 Shares Phil. & Wil. R.R., at 52,	1,827.50
				" paid Treasurer balance cash	22.50
	[The Trustees intend to transfer from General Fund stocks to make this property again $10,000.]	$8,700.00			$8,700.00

Errors Excepted. Boston, April 30, 1869.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} TRUSTEES.

Memo., April 30, 1869. The property of this Fund consists on date, of

50 Shares Globe Bank at 125	$6,250.00
35 Shares Phil. & Wil. R.R. at 52	1,827.50
U. S. Bonds $400 (Transferred from General Fund)	425.00
	$8,502.50

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT CR.
WITH THE WALKER PRIZE AND SPECIAL EXPENSE FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY.

1868.		
April 30.	To Cash Balance from account to date .	$27.15
July 1.	" received for Interest Coupons on U. S. Bonds	165.30
Sept.	" received from Trustees of Walker Fund, one half amount paid them	375.00
Oct.	" received from Trustees of Walker Fund, one half amount paid them	241.57
Dec.	" received for Interest, Coupons U. S. Bonds	187.28
1869.		
March 1.	" received from Trustees of Walker Fund, one half amount paid them	375.00
April 5.	" received from Trustees of Walker Fund, one half amount paid them	241.58
April 5.	" received for U. S. Bonds, sold by vote of Trustees, they judging it safer to hold property not so readily conveyable as Bonds, and not subject to loss by robbery, $5,150 at 113½ less proportion to Interest, as per next entry . .	5,741.25
April 5.	" received for proportion of above $5,150 at 113½, belonging to Coupon Interest	104.00
		$7,458,13

1868.		
July.	By Cash paid for U. S.' 67 Bonds ($100) .	$108.75
Sept.	" " " " " " (300) .	326.25
Oct.	" " " " " " (200) .	217.75
Dec.	" " " " " " (100) .	110.02
Sept.	" " " " " " (100) .	108.87
1869.		
March 1.	" " " " " " (400) .	452.00
April.	" " " Stock as follows:	
	19 Shares Atlas Bank, at 116	2,204.00
	26 Shares Tremont Bank, at 120½	3,133.00
April 30.	By Cash Balance on hand	797.49
		$7,458.13

Errors Excepted. Boston, April 30, 1869.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE, } TRUSTEES.
E. PICKERING,

Memo., April 30, 1869. The Property of this Fund on date consists of

19 Shares Atlas Bank at 116	$2,204.00
26 Shares Tremont Bank at 120½	3,133.00
Cash on hand	797.49
	$6,134.49

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account with the Income from the Walker Fund of the Boston Society of Natural History. Cr.

Date	Dr.	Amount	Date	Cr.	Amount
1868. Sept.	To Cash, six months' Interest on note secured by mortgage	$750.00	1868. Sept.	By Cash paid to Treasurer, one half of amount received on date for Interest on Note	$375.00
Oct.	" six months' Interest on note secured by mortgage	483.15		" paid to Trustees of Prize Fund .	375.00
1869. March 1.	" six months' Interest on note secured by mortgage	750.00	Oct.	" paid to Treasurer, one half amount received Interest on note secured by mortgage	241.58
April 5.	" six months' Interest on note secured by mortgage	483.15		" paid to Trustees of Prize Fund .	241.57
			1869. March 1.	" paid to Treasurer, one half amount received on date	375.00
			"	" paid to Trustees of Prize Fund .	375.00
			April 5.	" paid to Treasurer, one half amount received on date	241.57
			"	" paid to Trustees of Prize Fund .	241.58
		$2,466.30			$2,466.30

Errors Excepted. Boston, April 30, 1869.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} Trustees,

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account Cr. with the Bulfinch Street Estate Fund of the Boston Society of Natural History.

1868. June 6.	To Cash received Interest 6 months on note secured by mortgage	$450.00	1868. Apr. 30.	By Balance due the Trustees on date	.23
			June 6.	By Cash paid for $400 5-20 U. S. Bonds, without July Coupons	$433.38
July 1.	" received for Interest Coupons on 5-20 Bonds	315.97	July 1.	" paid for $300 U. S. 5-20 Bonds	326.25
Dec.	" received 6 months' Interest on note secured by mortgage	450.00	Dec.	" paid for $600 U. S. Bonds	662.04
"	" received for Interest Coupons on Bonds	348.38	1869. April.	" paid for 84 Shares of Tremont Bank Stock, at 120½	10,122.00
1869. April.	" received for U. S. Bonds sold by vote of Trustees, it being thought best to invest in property that cannot be transferred so readily as Bonds, $8,850 at 113½	10,044.75	" 30.	Cash on hand on date	142.45
"	" received from General Fund	77.25			
		$11,686.35			$11,686.35

Errors Excepted. Boston, April 30, 1869.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} Trustees.

Memo., April 30, 1869. The Property of this Fund consists of

Mortgage Note of J. B. Smith	$15,000.00
84 Shares Tremont Bank Stock, at 120½	10,122.00
Cash on hand	142.45
	$25,264.45

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account with the Wolcott Fund of the Boston Society of Natural History. Cr.

1869. Apr. 30.	To Cash balance on hand on date	$15.51	1868. July 1.	By Cash paid for U. S. '67 Bonds, $200	$217.50
July 1.	" received for Interest Coupons on U. S. Bonds	226.00	Dec.	" paid to Treasurer to be expended by him for books	244.51
Dec.	" received for Interest Coupons on U. S. Bonds	217.48	"	" paid to Treasurer for books	217.48
"	" received for U. S. Bonds, $200	220.50	1869. Apr. 30.	" paid to Treasurer for books (Not all expended by the Treasurer for books. The balance—$613.26—is therefore added to the Fund, as per provision of trust.)	337.50
1869. Apr. 30.	" received for Interest Coupons on U. S. Bonds	237.50	"	" paid for $6,000 Chicago and North Western Bonds, received in exchange for U. S. Bonds, as opposite, and of Treasurer	6,000.00
"	" received for Interest accrued on Bonds sold	100.00			
"	" received for $5,000 U. S. Bonds sold, exchanged for Chicago and North Western Bonds	5,575.00			
	" received for $400 Government Bonds, 5-20's	425.00			
		$7,016.99			$7,016.99

Errors Excepted. Boston, April 30, 1869.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING,
} Trustees.

Memo., April 30, 1869. The Property of this Fund on date consists of Chicago and North Western Railroad Bonds $6,000.00

Which represent $6,058.27; the increase being due to non-expenditure of the whole income for books.

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account with the Pratt Fund of the Boston Society of Natural History. Cr.

Date	Dr.	Amount	Date	Cr.	Amount
1868. Oct. 31.	To Cash received, three per cent. on $10,000 New York Central Railroad Bonds, less Tax	$285.00	1869. Apr. 30.	By Cash paid to the Treasurer	$585.00
April.	" received Interest on Bonds	300.00	"	" paid for stock as follows:	
	" received for $10,000 New York Central Railroad Bonds, by vote of the Trustees	8,472.32		50 Shares Norwich and Worcester Railroad, at 104	5,212.75
				6 Shares Boston National Bank, at 109½	657.25
				10 Shares Webster National Bank, at 107	1,072.75
				27 Shares Philadelphia and Wilmington Railroad, at 51⅞	1,407.63
			"	By Cash balance on hand on date	121.94
		$9,057.32			$9,057.32

Errors Excepted. Boston, April 30, 1869.

THOS. T. BOUVÉ,
CHAS. JAS. SPRAGUE,
E. PICKERING, } Trustees.

Memo., April 30, 1869. The Property of this Fund on date consists of

50 shares Norwich and Worcester Railroad at $104	$5212.75
6 shares Boston National Bank at $109½	657.25
10 shares Webster Bank at $107	1072.75
27 shares Philadelphia and Wilmington Railroad at 51⅞	1407.63
Cash on hand	121.94
	$8472.32

The Nominating Committee presented a list of candidates for office during the ensuing year, and the following gentlemen were elected: —

PRESIDENT,

JEFFRIES WYMAN, M.D.

VICE-PRESIDENTS,

CHARLES T. JACKSON, M.D., THOMAS T. BOUVÉ.

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EDWARD S. MORSE,	MOLLUSKS.
JAMES A. ALLEN,	REPTILES.
CHARLES F. FOLSOM,	MAMMALS AND COMP. ANATOMY.

May 19, 1869.

The President in the chair. Twenty-three members present.

Dr. Jeffries Wyman exhibited the head of a crocodile, *C. acutus*, obtained in the Miami River, as it enters Key Biscayne Bay, Florida. This was presented to him by William H. Hunt, Esq., of Miami, and was the second that had been shot at that place. The existence of a true crocodile within the limits of the United States has not been previously recognized, though the species just mentioned has long been known in Cuba, San Domingo and South America.

The following paper was presented :—

On a Chick with Supernumerary Legs. By Elliott Coues, A. M., M. D.

The anatomical peculiarities involved in the freak of nature I am about to describe, are sufficiently remarkable to render this monstrous chick something more than an object of vulgar curiosity, and appear quite worthy of being placed on record. Although four-legged chicks, like double-headed calves and pigs, are not of very rare occurrence, comparatively speaking, this instance of monstrosity by redundancy is unique, so far as I am aware, in the extent to which nature has made sport of her laws for the development of limbs, and in the kind and degree of asymmetry thereby produced.

Regarding the development of supernumerary limbs, or parts of limbs (the latter involving the production merely of redundant segments), two conditions have been so generally observed to obtain, that they may fairly be held expressive of a certain kind of law to which even these seemingly pure freaks are subjected. The first is the degree of constraint imposed by the fundamental law of bilateral symmetry, in obedience to which accessory or redundant limbs are prone to make their appearance in pairs, opposite each other, on either side of the body, so that the monster remains symmetrical, as far as bilaterality is concerned. Two-headed creatures, in particular, rarely, if ever, show departure from this condition. The second is, that liability or tendency to reduplication of segments of limbs increases from the proximal to the distal extremity of a member, *pari*

passu, it would seem, with the rate of increase of the normal number of segments. Instances of duplication of a whole limb are so extremely rare that they bear, perhaps, no computable proportion to those in which distal segments alone are abnormally multiplied, appearing in the form of supernumerary digits; and I have not before met with, nor do I recollect seeing any record of, a case wherein the modification by redundancy was so profound as to affect the scapular or pelvic arch. On the other hand, extra digits are so common, as well in lower animals as in our own species, that statistical tables have been drawn up, showing the percentage of their occurrence, their comparative frequency upon one or both sides of the body, and upon the fore and hind limbs, as well as, to a degree, the influence of race, sex, temperament, etc., in their production; and even permitting some application to them of the law of antero-posterior, as well as bilateral, symmetry.[1]

This chick's malformation by redundancy appears utterly refractory, violating the first principles usually found to hold in cases of monstrosity by duplication of parts, and carrying the heteromorphy to the greatest possible degree; inasmuch as the two supernumerary legs are both on the same side, both composed of the normal number of osseous segments, and both separately and movably articulated with the pelvic arch; the latter presenting three acetabula on one side, and being otherwise modified in shape. But even in the obscurity of this extreme modification, no less of a hæmal arch than of its diverging appendages, may be discerned a curious and instructive display of the force of the law of bilateral symmetry, operating under well-nigh hopeless circumstances.

At Columbia, S. C., early in April, 1868, my attention was invited to a "four-legged chicken" that had just been hatched, forming one of a numerous brood, all the rest of which were perfect. The little creature appeared healthy, and was well-formed, except that it had three legs on the left side. It ate freely, and the only trouble it had was in walking; for although seemingly so well provided for in the matter of legs, it could only use one of the four to any advantage, the others being useless encumbrances. In moving it hopped on the right leg, occasionally supporting itself on the foremost left one, while

[1] Consult, in this connection, Prof. B. G. Wilder's able and instructive paper, "Extra Digits," in the Publications of the Massachusetts Medical Society, Vol. II, No. 3.

the middle one dragged on the ground, and the hind one was elevated behind; but it continually fell over on its left side.

The supernumerary legs were not merely offshoots from the normal one, or dangling by tegumentary attachments; but were entire, movable from the hip-joints, and apparently provided with all the ordinary muscles; but from some defect in the articulations, or want of voluntary control over their muscles, they were functionless, and, indeed, decidedly worse than useless. They were clothed with skin and feathers to the usual point (tibio-tarsal joint), and projected outside the common integument of the body as far up the thighs as the normal legs did. The middle left leg was bound by common integument to the anterior one as far as the heel; the posterior left leg was freely isolated. The right leg was perfect in every respect; the left one corresponding to it (anterior one of the three) was as large, and equally perfect, except in a slightly increased stiffness and basal adhesion of the anterior toes; the sole of this foot rested on the ground in normal position. The middle left leg (anterior supernumerary one) was scarcely shorter, and very nearly as stout; it dangled close behind and reached the ground, but was twisted half around by great eversion of the thigh, so that the knee pointed outward instead of forward, and the heel inward, while stiffening, or other defect of the tibio-tarsal joint, caused the metatarsus to project nearly horizontally outwards. The toes of this leg were permanently stiffened, flexed and drawn together; and in consequence of the direction of the preceding segments, their outer sides instead of their plantar surfaces were opposed to the ground; and all the claws, the hind one included, pointed forward and outward. The anterior claws, however, would have pointed backward could they have been outstretched. The third or posterior (second supernumerary) left leg was stunted as well as misshapen. It projected far backward, almost under the tail, and was permanently so much flexed at knee and ankle that the toes did not touch the ground. The flexures and direction of the segments of this leg were all normal; the foot and toes perfect in shape and relative proportions. Its chief peculiarities were its permanent flexion and its general marasmic condition—the stunting affecting bones and muscles alike. Corresponding to this atrophied condition was a lack of pigmentary matter in the scaly parts of the leg; these being yellowish flesh color, while the other three legs were dusky. When the chick moved about, this posterior leg spasmodically sawed the air in the vain attempt to coördinate its motions with those of

the anterior one; while the middle one followed the latter like a simple appendage, in consequence of being bound to it as far as the heel by integument.

Such were the external appearances presented by this malformed chick. After observing it for a few days I had it killed, in order to examine the internal structure of the anomaly, and found the following condition of the osseous structures involved. The right leg was normal in all respects; and so also was the corresponding side of the pelvis. The pelvis as a whole, however, was asymmetrical, the left side being abnormally developed to furnish points of support to the two extra legs. Behind the left ilium proper (which was shorter than the other one) appeared an accessory plate of bone, of an irregularly triangular shape, convex above in every direction, running out in a sharp point laterally; separated anteriorly by a deep narrow fissure from the termination of the proper ilium, closely joined, if not really articulating with, the vertebræ mesially, and in similar intimate relations, inferiorly, with an irregular backward prolongation of the ischium. The latter appeared to be duplicated like the ilium; but the nature of the ischial redundancy was not clearly made out; this part of the bone having been accidentally injured before it was seen or suspected to exist. The redundant iliac bone bore upon its antero-external and postero-external aspects, two acetabula, imperfect, but still well marked and unmistakable, for the movable articulation of the two extra femora; all three of the left legs thus depending from the haunch-bones in a row, one behind the other.

Each of the three left legs possessed the normal number, position, shape and relative sizes of the component bones, even to the phalanges, which numbered on each foot 2, 3, 4, 5, as usual; only the third, or posterior leg was, as has been said, slenderer and weaker than the other two; and the head and trochanter of its femur were not quite so perfect. The positions of the three legs having been already noted in the description of their external appearance, it only remains to call attention to the very singular characteristics presented by the middle left leg,—the anterior of the two extra ones.

Close inspection reveals the indisputable and highly interesting fact, that this is, in reality, a leg of the right side, transferred by some strange freak and in a totally inexplicable way, to the left side. This curious fact is susceptible of direct and positive demonstration from the characters of the bones themselves, and is proven beyond all question. This leg, as has been said, was, when in situ, so far everted

by outward rotation of the thigh, as to be almost reversed. The femur and convexity of the knee pointed outward, downward and *backward*, instead of forward; the leg and convexity of the heel inward, downward and *forward*, instead of backward; the front of the metatarsus ("tarsus" of ordinary descriptive language) faced directly backward; the hind toe pointed forward, and the three anterior toes would have had the opposite direction could they have been extended and outspread. It is needless to go into the details of the articular extremities of the bones, the shapes and planes of which all proclaim the same fact of the reversion of the whole limb. Now in this reversed position of the leg, the fibula, as usual, lies upon the outside of the tibia, and the three-jointed lateral toe, as usual, is the inner one. But on rotating the femur inward, so as to bring its axis, and that of succeeding segments, in the same plane as, and parallel with, the corresponding segments of the other two legs, the fibula is found upon the inner side of the tibia, opposed to the inner condyle of the femur; and also the outer five-jointed toe comes on the inside, where the one with the three joints ought to be. Such a state of things involves an anatomical absurdity; the conclusion is irresistible and almost self-evident, that, in a word, we have here a right leg, turned hind part before, and hung on the left side.

I should not have considered it necessary to more than simply state this fact, were it not such a unique phenomenon as to excite natural doubts, and call for the proof I have given.

This four-legged chicken, then, has really two *pairs* of legs—two right legs and two left legs. The middle leg upon the left side is the right redundant limb—the mate of the left supernumerary member,—that has in some inexplicable way got on the wrong side. Thus far has bilateral symmetry ruled in even such an anomaly as this; it has stamped a misplaced limb with unmistakable characters, in the vain struggle to retain and assert its supremacy.

Dr. J. Wyman said it was not necessary to suppose that one of the supernumerary legs was transferred from the opposite side. It has often been observed that when a limb is more or less doubled it consists of both right and left parts. A left arm doubled below the elbow has right and left fore arms and hands; a whole limb may be doubled in an analogous manner.

Section of Entomology. May 26, 1869.

Mr. P. S. Sprague in the chair. Eight members present.

The following papers were presented:—

AMERICAN LEPIDOPTERA. I. GEOMETRIDÆ LATR.

BY C. S. MINOT.

Fidonia bicoloraria nov. sp. Al. ex., 1.10 inch. White spotted and marked with brown. Tibiæ white. Margin of primaries brown, except at the terminations of the nervures of secondaries white. Above; primaries with brown spots most numerous at the base and along the costal border, and two broad, maculated bands extending from the anterior to the inner edge; the first, subapical, tapers slightly towards the inner margin; the second is marginal, and of uniform width. Secondaries with a few spots chiefly on inner and outer portions. Both wings have a dot at the outer termination of the cell. Beneath markings above very faintly repeated except the cellular dots, which are as distinct as above. Massachusetts, July? Coll. Min.

Fidonia Faxonii nov. sp. Al. ex., 1.5 to 1.12 inch. Ferruginous densely spotted with brown. Above primaries darker than secondaries, with three transverse, erose, brown bands, narrow, and most distinctly defined towards the base of the wing, while towards the exterior border they have a tendency to disappear into the ground color. Between the second of the bands and the third, and between the third and outer edge, are sparsely scattered in blotches, a few white scales. The first band extends from near the middle of costal margin almost, if not quite, to the interior; the third from near the apex to the inner border, and owing to the white scales it is more distinctly defined exteriorly than the other two. The second from half way between the first and the third on the costal margin to any point between their interior terminations, being extremely variable in its direction, though always starting from the same point on the costa. Secondaries fulvous, with three bands, like primaries. The first on the basal third passing through the centre of the discal cell, has an outward curve following the direction of the exterior margin. The second extends from the middle of the anterior border

curving in nearly a semicircle round the cell to the second divarication of the median, then recurving ends near the anal angle. The third extends, slightly curving, from the exterior to the anal angle, and is not very distinct, as the space between it and the external border is of a deep ferruginous brown, forming indeed a marginal band. Beneath both wings fulvous, almost chromaceous, sparsely spotted with brown. Primaries with bands of upper surface repeated without white scales. Third band nearly obsolete. Secondaries with bands of upper surface repeated; third nearly obsolete. No traces of the marginal one exist, except that the brown spots are thicker along the outer border.

This species is very common throughout New England in July and August. It is found in pathways and sandy open glades, flying in the hottest sunshine. I have named it after my friend Mr. Faxon.

Anisopteryx ? strigataria nov. sp. ♂ Al. ex., 1.5 to 1.7 inch. Smoky, plain silvery white margin. Above, primaries with three transverse, erose, linear bands of a fuliginous color, extending respectively from the exterior and basal quarters, and the middle of the costal to the interior margin. The first is curved outwardly, the second is nearly straight, the third is very variable and irregular. Along the outer margin there is a continuous row of triangular, fuliginous, internervular dots. Secondaries dirty white, with a few brown scales, thickest near the external border, very faint traces of the continuation of the bands on the primaries, except at the inner margin, where the bands are broad, distinct, and taper so rapidly that (since the rest of the line is so nearly obsolete) we might perhaps say there were three triangular spots on the inner margin. The marginal dots of the forewings have become a narrow line. There is a brown spot at the termination of the disk. Beneath, both wings color of the upper surface of the secondaries, with a few brown scales at the outer third of the subcosta, with a dot at the termination of the disk. Mr. Sanborn informs me that the ♀ is wingless.

Taken around Boston on the last of April and the first of May, in the same places as *A. vernata* (Peck) Harris. Flies towards dusk.

Var. Primaries above with a transverse sinuous band near the outer margin.

Colls. Min. and Bost. Soc. Nat. Hist.

Tephrosia fumataria nov. sp. Al. ex., 1.4 to 1.6 inch. Smoky, spotted and marked with brown. Above, primaries with a transverse, somewhat nebulous band, sinuate and erose on the ex-

terior margin, and extending from near the apex parallel to the outer edge, and a second broader one, quite faint, from the costal subapical angle, formed by a succession of blotches. A third and fourth each nearer the base, often wanting, or represented only by a nebulous spot on the costa. A marginal row of fuliginous internervular dots, on the secondaries becoming subtriangular. Secondaries with all except the basal band of primaries continued, becoming more nearly linear. The second from the apex has become a fuliginous series of inward curves. Both wings marked with irregular blotches. Beneath dirty white, with a silvery lustre. Primaries with marginal spots.

Taken in West Roxbury, Mass., in April. Though the markings are not distinct, but clouded, the species is easily recognized.

Description of the Male of Limenitis Proserpina. By C. P. Whitney.

On the 4th of July, 1868, I captured near Lake Tanapus, in Brookline, N. H., a female *L. Proserpina*. Agreeably to request of Mr. Scudder, who very kindly loaned me a male for the purpose, before I was aware I had one in my collection, I have compared the sexes, and will notice here the chief points of difference.

The band on the wings, which in the male is blue, and obsolete on the primaries, in the female is light metallic green, extending across both wings, becoming whitish on the primaries, but much wider on the secondaries, shading almost to the base. The lunules are also green. On the lower surface the band corresponds to that of the male, but is much wider; greenish, instead of blue, and white, wide and distinct on primaries. This band above and below is much more irregular in its contour than in *Arthemis*, and on the secondaries extends nearer the margin, as in *Ursula*, between which and *Arthemis* it seems to form a connecting link. Male expands two and three fourths inches. Female three and one fourth.

June 2, 1869.

The President in the chair. Twenty-six members present.

The following paper was presented:—

Observations on the Marsh Hare. By Elliott Coues, M.D.

Lepus palustris *Bachman.*

Lepus palustris Bachman, Journal Acad. Nat. Sci. Philad., VII, 1837, pp. 194, 366, pl. XV, XVI; and VIII, 1839, p. 79.—(Read 1836.)

Lepus palustris Audubon, Orn. Biog., IV, 1839, p. 510, pl. CCCLXXII (of *Buteo "vulgaris"*).

Lepus palustris Waterhouse, Nat. Hist. Mam., II, 1848, p. 119.

" " Audubon and Bachman, Quad. of N. Am., I, 1849, p. 151, pl. XVIII.

Lepus palustris Baird, Mam. of N. Am. (P. Rr. Rep., VIII), 1857, p. 615.

Lepus Douglassii, *var.* 2, Gray, "Charlesw. Mag., N. H., Nov., 1837, p. 586." (Fide Baird.)

In the work above cited, Audubon and Bachman state that the "Marsh Hare has been seen as far north as the swamps of the southern parts of North Carolina." It is the most abundant and characteristic mammal along the coast of this State, on Borden Banks and contiguous islands, as far north, at least, as Cape Lookout; and its ordinary range extends somewhat further. The same authors accord it a range extending to Texas; Baird, however, is inclined to doubt the correctness of assigning this locality. It appears to be strictly a maritime species, almost exclusively confined to the vicinity of the sea; one of the most interior localities thus far accredited being the swampy ground along the Wateree River, between Columbia and Charleston, S. C.

Along a considerable part of Borden Banks, a narrow strip of dry ground, overgrown with shrubbery and rank weeds, separates the sea-wall of sand drifts from the low, flat, reedy marsh on the Bogue Sound side. This situation is the favorite resort of the rabbits upon the island; they apparently prefer it to the marsh itself. In some places, in fact, they are so numerous that the thick shrubbery resembles a great warren, intersected as it is with numberless covered pathways, beaten by innumerable footsteps, and plentifully bestrewn with

ordure. Many of these paths lead to and from the marsh; and the animals' tracks are often seen in the dry upper belt of the sea beach itself. But I have never yet, in the course of many rambles, startled a hare in the muddier parts of the marsh, nor seen footprints or excrement in the oozy black soil; and am inclined to think that the prevalent impression regarding the decidedly aquatic habits of the animal is somewhat exaggerated. However it may be in other localities, the hares on Borden Banks prefer to stay where they can pass dry-shod over the ground; will run around rather than enter pools, and only betake themselves to the water in emergencies. This opinion I find corroborated by the observations of those with whom I have conversed upon the subject; and it is further sustained by the location of the remains of the numerous traps with which the natives used, in ante-bellum times, to capture the unsuspecting little animals. All the dead-falls I have seen, and they have been many, were placed, without exception, around the edges of the marsh, in comparatively dry places. That the little knolls scattered about in the beginning of the marshes, before the ground subsides to the general water's level, are especial places of resort, is shown by the quantity of droppings found in such situations. In the face of positive and unequivocal testimony, such as Audubon and Bachman give, no one can pretend to deny either the aquatic instincts or natatorial capabilities of the animal; but I think that the generalizations deduced by these authors from the illustrations that they bring forward, require some qualification.

I have met with no wood rabbits (*L. sylvaticus*) on Borden Island, and do not think that the two species are there associated, though such is the case in many other localities. The observer has consequently no opportunity of directly comparing the appearances presented by these animals during life; but one familiar with the looks of the cotton-tails (and who is not?) cannot fail to be impressed at first sight with the different aspect of the marsh rabbits. The difference in the contour of the body, and in color, is readily appreciable at any distance; and the gait is strikingly dissimilar. The marsh rabbit looks much darker, and duller, and, in particular, fails to discover the conspicuous white spot that the upturned tail of the wood rabbit discloses, and which has earned for the latter its aptly expressive designation. The marsh rabbit also looks smaller, although actual measurement does not show any very decided difference in size. This deceptive appearance is owing to the different gait just alluded to.

The animal's general configuration is more squat and bunchy; it seems to run with its body nearer the ground; scuttles along with shorter, quicker steps, more constrained and spasmodic, moving by jerks, as it were; and has little or nothing of the free bouncing movements that mark the progress of the wood rabbit. In these respects the last named species is exactly intermediate between the marsh rabbit and the large "Jackass" hares (*L. callotis*, etc.) of the West, in which length of stride, height of bound, and general freedom of swinging gait, reach an extreme. These Western hares are the swiftest of their tribe in this country, and the marsh rabbit is just the opposite. As attested by all observers, the speed of the latter is appreciably less than that of even the wood rabbit, though it certainly appears to get over the ground quite cleverly, particularly to one who has just missed, by undershooting, a running shot.

The marsh rabbit has the habit, common to other species, of evading the pursuit of dogs by throwing them off its track, making a detour, and returning to the spot whence it was started. I have frequently witnessed this performance—the animal, after running at its best for a few yards, with the dog close at its heels, plunging into some thick clump of bushes, reappearing after a few moments to one side or the other, at right angles to its original course, and then stealing quietly along at an easy gait, while the dog was intently pursuing a contrary direction. After this exploit, the rabbit usually came directly back to the spot where I stood, and could be very easily secured. I did not observe upon such occasions that the animal directed its course more particularly toward the marsh, than in any other direction.

During February, March and April, every specimen out of a score or more that I examined, was terribly infested with ticks.[1] These parasites were found clinging all over the body, but were especially numerous about the head, neck and ears—the latter more particularly. Both the inner and outer surfaces of the ears were, in some instances, literally covered. Notwithstanding such extreme infestation, the animals did not appear to have been materially inconvenienced, and they certainly had not suffered in flesh or general appearance. According to Audubon and Bachman, the marsh hare is also "infested with a troublesome larva of an œstrus in the summer and autumn;

[1] My friend, Dr. A. S. Packard, Jr,, to whom I sent specimens for identification, discovers these ticks to be of an undescribed species of *Ixodes*, which he has called *I, leporis-palustris.* (Ann. Rep. Peab. Acad. of Science, 1869.)

which penetrating into the flesh and continually enlarging, causes pain to the animal and renders it lean."

While it is not to my present purpose to give any special description of the marsh hare, I may mention a few points of external form before proceeding to a consideration of the skull, the decided peculiarities of which, as compared with that of the wood rabbit, I wish to elucidate. The animal's gait already described is a direct consequence of the comparative shortness of its legs—of the hinder ones particularly. A part of its bunchy appearance is due to the disproportionally large head. When closely examined, its physiognomy is noticeably characteristic, owing to the unusual size of the eyes, and of the upper incisors. Whether the condition of the former organs is related, as cause or effect, to nocturnal habits of the animal, I am not prepared to say; the proportions of the incisors, however, in all probability are directly correlated to the nature of the vegetable substances upon which the animal ordinarily feeds. The shortness of the ears, and their great proportional width, are noticeable features. The remarkable shortness of the tail, which exhibits the extreme among American hares, so far as I know, appears to be of a part with the equally noticeable scanty furring of the feet, and to be connected with the semi-aquatic habits of the animal. The condition of the fur (aside from considerations of color) is palpably a similar result, or to speak more correctly, a similar evidence of designing adaptation. Though very dense, the under fur particularly, it has a peculiar coarseness and harshness to the touch; it is not so glossy, or does it lie so smoothly as in other species, appearing matted and "shocky"; and the longer hairs are very numerous, stiff and wiry. This condition is partly due, I think, to the mechanical action of the reeds, among which the animal spends much of its time; constant friction of the coarse wiry rushes and saw-like silicious grasses effecting a certain roughening and fraying of the fur. An entirely analogous condition is seen on the plumage of certain birds that live in the same situations, as the sea-side finches and clapper rails; in which latter, indeed, the fraying of the feathers is carried so far as to become very palpable to the eye. The length and number of the bristles may be designed as protection against too great an injury of the rest of the fur.

The following dimensions of an adult male, taken in March, will be found to differ somewhat from those given by Audubon and Bachman; and are believed to represent an average. In total length, the

animal hardly differs appreciably, if at all, from the wood rabbit. The shortness of the tail, it will be observed, is due mainly to the paucity of the furring, and not to the characters of the vertebræ themselves.

Nose to end of out-stretched hind feet	22.25 [1]
" root of tail	15.00
" end of tail vertebræ	16.75
" " " hairs	17.50
" root of ear	3.00
Length of ear	2.30
Width "	1.70
Length of eye (antero-posterior diameter)	.50
Elbow to end of middle finger	4.00
Heel to end of middle toe	3.40

Skull. In the following paragraphs the comparative expressions used have reference to the cranium as related to that of *L. sylvaticus*.

The skull, as a whole, is strikingly larger, as shown by the following measurements; and most of its ridges and sulci are more developed.

Measurements.	*palustris.*	*sylvaticus.*
End of occipital platform to end of nasals	3.08 [1]	2.80
Anterior border of foramen magnum to incisors	2.38	2.12
" " " " " palate	1.33	1.15
Inter-paroccipital diameter	1.00	.70
Inter-squamosal "	1.10	1.08
Inter-zygomatic "	1.45	1.35
Inter-molar diameter	.88	.80
Greatest width of nasals	.55	.55
Least width of frontal	.70	.70
Length of frontal	1.35	1.20
" " nasals	1.30	1.18
" " malar	1.35	1.15
Vertical diameter of foramen magnum	.40	.40
Width across occipital condyles	.33	.33
Antero-posterior diameter of orbit	.95	.88
Vertical diameter of orbit	.68	.68
Greatest length of premaxillaries	1.35	1.30
Width of upper incisors at base	.30	.25
Length of anterior palatine vacuity	.75	.70
Angle of lower jaw to tip of incisors	2.40	2.10
Condyle of " " "	2.10	2.00
Height of condylar process	1.40	1.30

[1] English inches and hundredths.

The upper incisors, besides being larger, show a difference in the position of the groove, which runs between the inner and middle, instead of along the middle third of the tooth. Except in being proportionally larger, the molars show little difference; but, age for age, the transverse oval pits appear rather shallower.

The difference in the "zygomatic processes of the temporal bones" (i. e., of the squamosal), given by Audubon and Bachman, has no existence in any of the numerous specimens compared; these processes having as nearly as possible the same shape. That of *palustris* is absolutely larger, proportionately to the greater size of the whole skull.

The malar is longer, and also stouter; its greater length is chiefly due to development of both anterior and posterior processes; the point of the latter reaches half way from the zygomatic spur of the squamosal to the tympanic orifice. Notwithstanding the very appreciable difference in the size of the external eye, the bony orbits show little discrepancies in size. There is, however, a singular difference in the upper border of the orbital cavity. In *sylvaticus* the postorbital processes of the frontal have the form of slender spicula directed backward, touching the parietals at their extremities, transforming what would otherwise be a deep notch into an actual oval foramen on either side of the frontal; in *palustris*, both notch and foramen usually disappear by blending of this process with the frontal; sometimes, however, a minute opening remains. Similarly, the anteorbital processes in *sylvaticus* form a deep transverse notch, of which only a trace exists in *palustris*. The median anterior extremity of the frontal is prolonged in a point further between the nasals; while the posterior extremities of the latter are also more acutely pointed, and run further up on either side of the frontal. The slender nasal process of the intermaxillary is longer. The base of the skull is both relatively and absolutely broader, in consequence of the size and lateral projection of the paroccipital.

The form of the lower jaw, no less than the size of the incisors, would seem to indicate greater masticatory power. The various ridges and roughened depressions for muscular attachment are better pronounced. The angle of the jaw has more sweep, and extends further backward; the coronoid process is higher, wider, and more upright.

The skull of a full grown and mature (as shown by the dentition), but not an old animal, exhibits the following condition of the several

sutures, most of the bones, as will be seen, remaining unanchylosed. The epencephalic arch can be detached entire; the basi-, ex-, and par-occipital elements are completely soldered together; but the superoccipital shows traces of its original separation, its suture with the exoccipitals displaying the part it takes in the formation of the foramen magnum (production of the characteristic notch at the upper border). With the arch are brought away the petro-mastoid, tympanic and large bulla ossea; but neither of these three are soldered to it; and the two last, moreover, are further separable from the petro-mastoid; the remarkable quadrate platform of bone surmounting this arch is completely anchylosed with the superoccipital, and seems indeed to form an integral part of that bone, leading to a suspicion that it never formed a distinct interparietal.[1] Just in advance of this questionable plate, moreover, are two distinct little bones, irregularly triangular, together forming a lozenge on the median line; they remain suturely connected with the parietals on removal of the epencephalic vertebra. These may be a bifid interparietal, or ossa wormiana. The parietals are disconnected with each other, and from all surroundings. The squamosals may be removed with some little difficulty; they are free from parietal, frontal, and malar, but begining to anchylose with alisphenoid. The nasals and premaxillaries are very easily removed; a spongy mass is brought away with the former. The lachrymals almost fall out of themselves. The sphenoid may be loosened, but not entirely detached, without violence; traces of the union of the pterygoids with it remain; the limits of ali- and basisphenoid are plainly seen. The interfrontal suture is plain. The superior maxillaries are distinct from the frontal, and also show the median palatal suture; but the malars and palatines are both completely soldered with them. The large stout palatines, in fact, appear to be the most solid bones of the skull. Besides their extensive and firm union with the maxillaries, their palatal plates fuse together, forming with the corresponding processes of the maxillaries, a strong, bony bridge across the back part of the palate, connecting the molar alveoli. The two halves of the lower jaw remain separable.

With advancing age nearly all these sutures become obliterated. The most persistent are those between the nasals and their surroundings, the spheno-occipital, the squamo-malar, and the symphysis menti. These I have never found obliterated, though—particularly

[1] On the other hand, see Owen, Comp. Anat. and Phys. Vert., II, pp. 316, 367.

the last named—they may amount to virtual consolidation. The petro-mastoid and tympanic bulla are very late in coössifying with surrounding bones.

The basi-occipital (but not the basi-sphenoid) is perforated by what appears to be an extension of, establishing direct communication between, the tympanic air-cavities. According to Owen (op. cit., p. 368), the basi-sphenoid is similarly perforated in *Lepus timidus.*

Mr. H. A. Purdie announced the capture by Mr. C. F. Maynard, of three specimens of the rare Tennessee Warbler, in Newton.

Rev. R. C. Waterston called the Society's attention to the approaching centennial anniversary of the birth of Baron von Humboldt, and suggested the celebration of the day by the Society in some public manner. The proposition was received with great favor by the members who subsequently spoke upon the subject, and it was voted, on the motion of Mr. Waterston, to choose a committee of three to consider the subject and take such action as seemed advisable. The President appointed Rev. Mr. Waterston, Dr. S. Kneeland and Mr. S. H. Scudder, as the committee, to which the President and his Honor, Mayor Shurtleff, were subsequently added.

June 16, 1869.

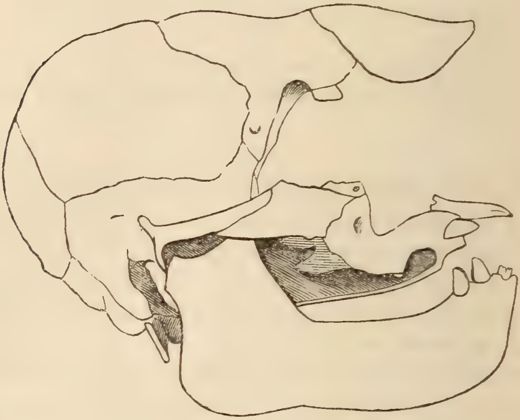
The President in the chair. Seventeen members present.

The following papers were presented:—

Notice of a Cyclopean Pig. By Elliott Coues, M.D., U.S.A.

I am indebted to my friend Dr. W. F. Smith, of the Army, for the opportunity of examining the head of a newly born cyclopean pig. The specimen, possession of which Dr. Smith has generously relinquished, has been deposited in Professor Wyman's cabinet. It is

interesting from its apparent bearing upon the question of the morphology of the cranium. If my interpretation of the general condition, and identification of parts, be not incorrect, there are unequivocal indications that this skull is composed of four vertebræ.



The modifications of the cranial bones produce a singular configuration of the external parts. The snout, or nose proper, is separated from the mouth-parts by a wide and deep fissure, reaching half way to the ears, in a horizontal plane, and in the longitudinal axis of the head. At the base of this fissure there is a transverse slit in the skin, across from side to side, representing the eyes, meeting on the median line, and directly continuous with each other; this cutaneous opening is about an inch and a third long by a third wide in the middle. With the exception of this slit, the whole face is continuously covered with proper integument, of normal texture, sparsely beset with slender white hairs. The gape of the mouth is unusually small; the lower jaw and lips offer nothing very peculiar; but the upper jaw is much shortened (through intermaxillary deficiency, as will presently appear) and the lip is extended some distance beyond it, to meet the lower lip; it is compressed from side to side, and has no nasal opening. The lower jaw bears six teeth, whereof the two lateral ones on each side are conical, acute and enamelled; the median

pair obtuse, widened, each with obscure indications of three cusps, and barely projecting from the gums. There are three teeth in the upper jaw, separated from each other; the lateral ones, apparently canines, being loosely set in, and projecting laterally outward from the upper alveoli; the third, directly on the median line, and seemingly representing the lateral pair of incisors combined, is only set in gristle, from which its hard, conical cusp projects forwards as well as downward, and from which its root was found, on dissection, to protrude inwards. The shape of the root, which is flattened and laterally expanded, seems to confirm the suspicion that this single tooth represents connate incisors.

The detached nasal chambers form a curious fleshy and bony "horn" or proboscis, running straight out from the forehead, on the median line, above the ocular slit, as far as, or rather beyond, the end of the maxillary snout. This proboscis has the form of a nearly regular gradually tapering cone to near the end, where it suddenly enlarges to terminate in a circular disk, with a single central hole—a common nostril. The general shape calls to mind the snout of the star-nosed mole, barring the fimbriæ.

The rest of the head is not noticeably misshapen, though rather short for its depth. The ears are large and well formed.

There is not such palatal malformation as might be anticipated in a case of this sort; on the contrary, the bony roof of the mouth and its mucous membrane are perfect. Just behind the palate, in the normal position of the posterior nares, there is a slit leading into a roundish depression capable of holding a pea; this, however, does not (nor could it, in consequence of the abnormal condition of the bony parts, presently to be described) lead into the nasal cavities, but forms a cul-de-sac, only perforated by the openings of the Eustachian tubes, which are large enough to admit a straw.

The nasal sense-capsules are wholly unossified; a conoidal mass of gristly and membranous convolutions fills the nasal chamber, in place of ethmoid and turbinals; the imperfect cartilaginous septum only extends to within three lines of the end of the snout, there being a common orifice. There is no cribriform plate: the olfactories pass by a large irregular opening from the brain into the nose, and proceed more than half way to the tip of the snout before giving off any ramifications.

The rudimentary eyes, only distinguishable with some difficulty, are imbedded in a mass of cellular and fatty tissue that fills the fossa

at the base of the great fissure. Notwithstanding their small size, the orbital cavity has a number of muscles of little less than ordinary dimensions, but scarcely recognizable in consequence of imperfect or faulty insertions, and displaced origins from the distortion of the bony parts. The optic nerves emerge from the cranium at the bottom of a large opening.

The superior maxillary divisions of the fifth pass through this same opening, across the floor of the orbital fossa, into and through the maxillary foramina (which are placed side by side, near the median line of the skull) and ramify in an undistinguishable mass of muscular and cellular tissue that lies upon the bones and forms the cheek and upper lip.

As is usual in these cases, the great commissure of the brain is wanting, the cerebral hemispheres being fused and presenting a single smooth convexity.

Such are the principal features of the soft parts chiefly concerned in the formation of the monstrosity; the shape and position of many of the cranial bones is equally anomalous. The osseous abnormities increase in number and degree from behind forward, as would naturally be expected, and culminate among the elements of the "rhinencephalic vertebra." Remarkable openings in the skull occur, isolating the several arches in great measure, and exhibiting them to the physical eye as clearly as they can be seen with the mind's. Particularly in the case of the fourth or anterior segment of the skull, we have the unusual spectacle of the centrum and hæmal arch distinct and removed from the neural; the latter alone enclosing the neural axis; and the former hanging from the cranium, somewhat after the manner of the succeeding hæmal arch (lower jaw), suspended by its own pleurapophysis alone, and not otherwise attached to the rest of the skull than by the zygoma. The general condition, in fact, comes near being an ocular demonstration of four vertebræ in the mammalian skull.

Detailed descriptions of the bones principally concerned will follow; we have here to note first the general condition of the skull as a whole, and next as composed of several segments.

The base of the cranium proper presents three principal openings or foramina lacera, succeeding each other from behind forward. The first of these appears to correspond to, and to result from, the confluence of the fissuræ laceræ posteriores and mediæ. It is an irregularly crescentic opening (one on either side the basi-occipital and

-sphenoid) bounded anteriorly by the alisphenoid, mesially by the bases just mentioned, and posteriorly by the basi- and ex-occipital; it would be a large roundish vacuity were it not for the projection into it from the outside of the large petrosal and inflated tympanic bulla; the fact that these do not reach the occipital base is what causes the merging into one of the posterior and middle fissuræ basis cranii. The second opening is a very large one, through which the tip of a finger may be passed, leading into the median optic fossa (conjoined orbital cavities), of an irregular, somewhat cordate shape, circumscribed behind by the alisphenoids, and before by what appears to be an orbito-sphenoid plate (see below). This gives passage to the optic nerves, as has been said, as well as to the second division of the fifth. The third opening is the irregular foramen in the curiously malformed frontal bone, giving exit to the olfactories, and standing in place of a "cribriform plate of ethmoid." These three fissures (the posterior one lateral and divided in two, the anterior two median and single) indicate, in a general way, the places of division of the skull into its four neural arches.

The zygoma, composed as usual of squamosal and malar, preserves posteriorly its ordinary condition; anteriorly, however, it curves inward as it passes forward, and meets its fellow on the median line, over the middle of the superior maxillary. A small bone, extending transversely across the median line, serves as a bridge across the anterior extremities of the malars, binding them together in front, and completing a perfect half circle or horse-shoe shaped bony bar, that horizontally surrounds the sides and front of the skull from one glenoid fossa to the other. This bone is formed of the two lachrymal bones fused. The upper jaw hangs below and projects forward from this half-ring, connected behind with the base of the skull by the palatals and vomer. Its superficial resemblance to a lower jaw is very striking.

The occipital segment offers nothing specially noteworthy. The coalesced ex- and par-occipitals are distinct from basi- and super-occipitals; all four have nearly if not quite their proper shape and position.

The basisphenoid is distinct from the basioccipital, but not from the presphenoid; with which latter the next centrum is also fused in great measure, and in fact is less demonstrable as such than usual, in consequence of the extensive blending of the palatals. A vomer is scarcely indicated except by a median longitudinal ridge upon the

last named bones. The alisphenoid is large, and reaches the well-formed parietals, thus supporting its neural spine; it forms a stout pillar on either side, is but little expanded, and has no connections whatever either before or behind, in its continuity. The diapophysis of this segment is confluent with the squamosal, — not with the petrosal, as in many mammals. The last named (otic capsule) is of large size, and distinct from all surroundings. This, and the not very dissimilarly shaped tympanic bulla form two large osseous masses, on either side, distinct from each other and from adjacent bones, nearly filling up what would otherwise be an open space between the neurapophyses of the penultimate and last vertebræ. The intercalated squamosal, with its confluent mastoid, fills up what would otherwise be a further vacuity in the walls of the cranium; articulating with (besides the petrosal and tympanic) three of the elements of the occipital behind, the parietal above, and the alisphenoid and malar in front. It is of great size; its zygomatic process is small, and curved inward. The parietals are well developed, and of normal characters.

The next neural arch is mainly represented, as far as ocular demonstration can go, by the singularly shaped frontal, its spine. This bone has a pyriform shape; that is, it is made a cone by the curling under of its sides (or perhaps of its orbital plates) until they come together and coalesce below, and then suffers a constriction near its anterior extremity, the small end being then drawn out, and representing two-thirds of a ring which is deficient below; the scroll-like nasal fitting upon the ring. The upper surface of the bone is smooth, and shows the median furrow indicative of its development from two centres; the under surface is irregular, with several pits and foramina. It mostly articulates with the parietals, but the lower lateral corners touch the squamosals; it is, of course, widely separated from the superior maxillary and malar, which lie some distance in front and below. To the under surface of the frontal are attached two anomalous bones. The inferior and much the larger of these is a transversely elongated thin plate, adherent along its upper or anterior border with the posterior border of the frontal; touching the alisphenoids on either extremity; its free posterior border, concave, or nicked out, forms the anterior border of the large vacuity already described as leading from the cranial cavity into the orbital fossa. This bone I take to be orbito-sphenoidal, and therefore to represent the frontal neurapophyses; so judging from its position and relations, par-

ticularly to the optic nerves. The other bone is merely a little curved splint bridging across the lower part of the frontal ring from side to side, and partially making up for the defective condition of the latter. I do not know to what, if any, bone this bit is to be referred, and prefer not to hazard a conjecture. The hæmal arch of this third vertebra is not noticeably deformed, though rather unusually shortened, thickened and bent upward at the end. Each moiety is distinct, and has three projecting teeth; the future molars and premolars still lie buried in the jaw.

As we trace hæmal arches of the mammalian cranium, in the light of Owen's conception of them, we find that they are regularly graduated from behind forward, as to the kind and degree of their connection with the rest of the skull. That of the occipital segment is removed to the thorax, and only connected by muscular tissue. That of the parietal is suspended in the neck by ligamentous bands that may acquire bone-earth along a part or the whole of their course. That of the frontal is in contact with the rest of the skull, and movably articulated. That of the nasal is suturally united, in firm apposition, not only by extensive and intricate pleurapophysial connections, but also by that junction of the hæmapophyses and hæmal spines with neural elements that is necessary to close up the neural axis in front, and gives the more or less conical configuration to this extremity of the vertebral series. The obscurity that hangs over the "nasal vertebra," and the consequent difficulty of actually distinguishing neural and hæmal "arches," or of recognizing a "vertebra" at all, is commonly held — with what show of reason it is not my purpose to inquire — to result in great measure from this extreme modification in the face of a special emergency that does not elsewhere occur. Be this as it may, we have in the present instance of this malformed skull, a nasal vertebra, the neural and hæmal arches of which are distinct and separated from each other, and which displays vertebral characters at least as plainly as either of the other cranial segments do. It consists of a neural spine, surrounding and enclosing the prolongation of the neural axis, uplifted from its centrum, wanting neurapophyses, and with no osseous sense-capsule; and of a detached hæmal arch, represented by pleurapophyses, hæmapophyses, (and hæmal spine?) joined to its centrum, by the latter attached to the rest of the skull, with which it is only further joined by its "appendages."

The single nasal bone, apparently developed from one centre, is

rolled under like a scroll, to form an imperfect cylinder. Its only articulation is with the ring-like prolongation of the frontal, upon which its base is fitted by an oblique overlapping suture. It projects straight forward, like a horn, and enfolds the gristly and membranous sense-capsule; no osseous ethmoid, or turbinate bones, exist. The passage from the nasal chamber into the cranium is straight and open.

The palatines lack orbital plates or processes, are fused together and to the vomer, and consist chiefly of palatine plates, united in the usual way to the corresponding parts of the superior maxillary. Their chief peculiarity is seen behind, in the place where the posterior nares normally occur. The passage is blocked up by the fusion of the bones into a solid plate that reaches the sphenoid centre and forms a transverse wall. The palatines abut externally against the descending processes of the alisphenoids; along the line of junction there is a curved groove in which the loose pterygoids rest. The latter are small, irregularly falcate in shape, and completely detached both from sphenoids and palatines, as in monotrematous orders. The superior maxillaries are fused along the median palatal line, but elsewhere distinct from each other: and they form the apex of the jaw to the exclusion of intermaxillaries. Their palatal plates are their most perfectly ossified parts; for the rest, they are made up in greatest part of large alveolar cavities, filled with the future molars and premolars, the walls of which cavities, everywhere thin and fragile, almost spongy, are defective, particularly along the line where they should properly join the palatal plate, displaying the contained teeth through extensive vacuities. The inflated walls of these cavities form the only osseous floor of the orbits; they project like bullæ upward and backward toward the alisphenoids, from which, however, they are entirely separated by a continuous deep and wide fissure. The teeth that have cut the gum have been already noticed; the lateral pair are presumably canine from their relation to the superior maxillary, but occupy the place of incisors. The apex of the upper jaw is defective, and presents a depression between these two lateral teeth, occupied, in the recent state, by a cartilaginous mass, in which the median incisor was buried. The upper surface of the maxillaries offers a deep transverse depression, into which open the large foramina for transmission of the second division of the trigeminus; posteriorily it rises up to meet the under surface of the malars and be articulated with them, in a nearly straight and horizontal line from side to side.

As has been said, there are no intermaxillaries to be recognized as such, the superior maxillaries forming the apex of the jaw; and the gristly mass lying upon their extremity, and containing the incisor, being apparently the rudiments of those bones.

Notes on Beaver Dams. By Alex. Agassiz.

During a residence of nearly two years on Keweenaw Point, I had occasion to examine a large number of beaver dams, most of them still inhabited. I was particularly struck on visiting the first dam I had ever seen, which is the largest dam of the district, measuring no less than six hundred and fifty feet in length, and three and one half feet in height, with the small number of lodges in the vicinity of the pond. It seemed impossible that such an enormous structure could have been built by the limited number of families which the lodges would shelter. On examining other dams in more inaccessible places, the same was found to be the case, the number of lodges is small, the greatest number I have observed being five upon one pond. It was evident from this that we possessed erroneous notions of the gregarious nature of beavers, that they do not build their dwellings crowded together like huts of working men round a mill, and do not work together in great numbers, accomplishing the task of building their dams in a short time; on the contrary it became evident that their structures—their dams, their canals—are the work of a comparatively small number of animals, but to make up for the number, the work of the succeeding inhabitants of any one pond must have been carried on for centuries to accomplish the gigantic results we find in some localities. This fallacy of our knowledge of the beavers was first made public by Mr. L. H. Morgan, who, in his work on the American beaver, which appeared during the last part of my stay at Lake Superior, has given us a most capital history of the habits of the beaver. I can only corroborate the truthfulness of his descriptions by their perfect application to what I had seen of the beavers in the district which I examined, and state that I had arrived independently at many of the conclusions which he has drawn from his prolonged study, extending through twelve summers; it is refreshing in these days of works filled with descriptions of species, to turn to a monograph which reminds us of the times when the life history of a single animal and the study of their habits was not considered beneath the labors of a Huber or a Reaumur.

Morgan, in the work just quoted, after showing that the dams are the work of a comparatively small number of beavers, naturally also comes to the conclusion that they must be of great age from the amount of solid material they contain, from the destruction of the primitive forests within the area of the ponds, and other causes from which he concludes that these dams have existed in the same places for hundreds and thousands of years, and have been maintained by a system of continuous repairs.

In building an artificial dam across a beaver meadow, I came accidentally upon data showing that Morgan's view of the antiquity of beaver dams is correct. For the purpose of obtaining a secure foundation for a mill dam (erected at a short distance above a beaver dam), it became necessary to clear away the soil of the bottom of the beaver pond, which had been exposed by cutting the beaver dam below it.

This soil was found to be a peat bog of variable depth, attaining a thickness of six feet. A belt of this peat, twelve feet wide and somewhat over twelve hundred feet long, was removed, and imbedded in the peat below the surface peat of the bottom of the pond were found the traces of a number of stumps in various stages of decomposition, and here and there what looked like beaver cuttings, and finally the workmen came across several stumps where the marks of the beavers' teeth were still plainly visible, showing that the stumps found in the peat were probably all stumps of trees cut by beavers in former times; the bottom of this peat bog was two and one half feet above the base of the beaver dam. We have here positive evidence that in this case, at least, the peat bog was formed by the pond flowed by the dam, and the same state of things exists in several other dams which I examined. We find that they are always accompanied by larger or smaller peat bogs, all of which, as in the case above alluded to, owe their existence to the beaver dams. On sounding them, the depth of one of them was found to be as great as nine feet. In these instances careful levels were run from the dam towards the source of the creek upon which they are built, and on reconstructing the appearance of the country, as it must have been before the beaver dams existed, I found that from the nature of the surrounding country, the open spaces now joining the beaver ponds, the beaver meadows where the trees are scanty or small, must at one time have all been covered by forests similar to those which are found on the banks, and fully as luxuriant. It was only when the beavers established themselves upon the creek

and commenced to build their dams that they began to clear the forest just in the immediate vicinity of the dams extending in every direction, first up the stream as far as the nature of the creek would allow, and then laterally by means of their canals, as far as the level of the ground would allow, thus little by little clearing a larger area, according to the time they have occupied any particular place. Soon after the commencement of their dams, usually selected on such a spot of the creek as is sluggish, and where a slight elevation will give a large area for flowage, the ground must have become saturated with moisture, rank grass must have started up. Sphagnum soon made its appearance, and little by little, as the dam was raised, the area extended, and the marshy meadow prepared the ground for the ultimate formation of the peat beds observed, which extended little by little as far as the possibility of the ground would allow, covering by degrees the base of the stumps of the trees cut by the beavers, as well as of the bushes, covering the sticks left about with a coating of grass and peat, and either decomposing or preserving, as was the case in the peat bog observed, the stumps which are to tell us now how long they have been occupied in raising their dams.

The rapidity with which peat is deposited varies greatly in some districts of Switzerland, according to Lesquereux, to whose kindness I am indebted for the needed figures, taken from the exploration he conducted so successfully in various parts of Europe to ascertain the nature and growth of peat bogs. We find localities where at a fixed date no bogs existed, and after a lapse of fifty years had grown one and one half feet, so that we can take as a general thing a growth of about one foot in a century as the average, though the rate of growth varies according to localities, three feet in a hundred years having been observed, the lacustrine deposits growing at a much slower rate than the peat bog deposited in mountainous districts. So that in the case of bogs of the depth of nine feet, we can safely assume that the probable age of the dam is about nine hundred years, which would give a rational explanation of the possibility of building such huge structures by such small number of animals as are evidently the dwellers on the shores of the beaver pond of any one dam.

New dams are started, as stated by Morgan, by a pair of young beavers, and I find that considerable exploration of localities suited for new structures is made by beavers during the winter, when the crust of the snow is suitable, and their trails have been found at a distance of two and one half miles from the nearest dams, prospecting

for a site where they were invariably at work the following spring, commencing these dams in some cases where their dams were disturbed in winter, they would migrate bodily and establish themselves on the shores of a more isolated creek. They invariably build burrows when first starting their dams, and when the ground of the bank is not propitious they continue to dwell in them and do not build lodges, as was the case in a mud dam built across a rather steep valley where the flowage simply gave depth near the dam, and at a considerable distance from it, only spreading into a shallow sheet at too great a distance from the dam, evidently, to make that mode of inhabitation available.

The extent of the denudations of forests, thus artificially produced by the beavers, is quite extensive; the areas of some of these beaver clearings are very large. I have seen ponds of an extent of no less than forty acres, as the direct result of the backing water of a beaver dam, and beaver meadows of two to three hundred acres in area are by no means uncommon. When beaver dams are placed one below the other, as is frequently the case, the extent of country thus opened and cleared of forests by them may cover the large portion of several sections of land, changing into open swamp lands extensive tracts, which at one time must have been dry, and covered with dense forests. This interference of beaver dams is also frequently the cause of accumulations of water on ridges, from which the natural water sheds are altered. From talking with intelligent trappers who have hunted in the lands of the Hudson Bay Company, I learn that the works of the beavers are so extensive there in some localities, that they have played a not unimportant part in changing the whole aspect of large tracts of the country, and covering with water a great extent of country which was once thickly wooded.

On the Habits of a few Echinoderms. By Alex. Agassiz.

In the various reports of animals found at great depths in the ocean, the presence of *starfishes* attached to the rope at a considerable distance from the dredging or sounding apparatus, has been instanced as proving beyond doubt that they lived at great depths, and that the rope was dragging along the bottom, as their specific gravity was so much greater than that of the water that when placed in it they immediately sank. My object is simply to record a few notes of what I have observed on the seacoast at various times with refer-

ence to this point, but I wish at the same time to be distinctly understood as not denying on this account the fact of the existence of these animals at great depths, but simply to show how cautious we should be in making broad generalizations from the presence of a few animals at any one point, the habits of which we know nothing about. Carpenter, in his report on the deep sea dredging of the English Expedition of 1868, mentioned an Astropecten as attached at a distance of two hundred and fifty fathoms from the dredge, twelve hundred fathoms being out. Ross, while sounding at a depth of one thousand fathoms, found on the sounding line at a depth of eight hundred fathoms, a species of Euryale, and again while sounding at a depth of one thousand fifty fathoms, below the point marked eight hundred fathoms, a small starfish was found attached to the sounding line. Carpenter and Wallich both saying that "it is irreconcilable with what we know of the habits and structure of the Echinoderms, to suppose that the Caput Medusæ (Euryale) and small starfishes referred to could have been found free, floating and alive, at a distance of two hundred fathoms from the bottom."[1] Carpenter says of the Astropecten,[2] "As this animal is entirely unfurnished with swimming organs, and was found to be of such specific gravity as to sink immediately when placed in a jar of seawater, it can scarcely be taken up anywhere else than from the sea bottom."

Any one who has ever kept starfishes alive in a tank, cannot fail to have observed the tendency they have to creep up along the sides of the tank till the foremost arms reach the top of the water. They then continue to creep on, the anterior arms, however, not protruding out of the water, but turning over, spread with the suckers uppermost, extended to the fullest extent. This is carried so far that the starfish are frequently attached to the side of the jar or tank, only by a very small portion of the extremity of one arm, where the suckers are least powerful, and a portion by far too small to form a fulcrum for the upholding of the rest of the starfish in that attitude. If we examine the starfish (*Asteracanthion berylinus*) in that attitude, we shall find also that the body is by no means rigid, on the contrary the

[1] Wallich, G. C. The North Atlantic Sea Bed. London, 1862, p. 80.

[2] Carpenter, Dr. W. B. "Preliminary Report of Dredging Operations in the Seas to the North of the British Islands, carried on in her Majesty's steam vessel Lightning," by Dr. Carpenter and Dr. Wyville Thompson. From Proc. of Royal Soc. No. 107, 1868, p, 171.

whole abactinal area is expanded to its fullest amount, the arms and interradial part swelling out immensely, become quite flaccid, and the specific gravity of the starfish must, by the amount of water which it has thus taken in, be very nearly equal to that of water.

This operation I have repeatedly seen performed by starfishes, measuring five or six inches across the arms, and when the starfishes are young they frequently lose their hold, and float about on the surface of the water. Starfishes measuring two and one half and three inches across the arms, are able to float in this manner, and while fishing with the scoop net on the surface of the water for pelagic animals, hardly a single expedition goes by without finding one or two young starfishes, ranging from one eighth of an inch to one and one half inch across the arms swimming freely about. This is not limited to our two species of *Asteracanthion*. I have observed the same thing in the adult of our common *Cribrella* when kept in confinement, and young measuring three fourths of an inch across the arms, are frequently found swimming about. I had already in 1864 [1] called attention to the fact that young Sea-urchins, measuring somewhat less than one fifteenth of an inch in diameter, could be found with the scoop net swimming on the surface, and that the young of our Ophiurans, young Ophiopholis having already five joints on each arm, long after they have lost their plutean appendages, have the same habit of floating at will on the surface by expanding to their fullest extent. The same applies to young Cuvieria one half inch in length. I have never observed any such capacity in the older Ophiurans or Cuvieria. But there is another Echinoderm which, in the adult condition, is capable of a kind of swimming, that is the Euryale. In my work on Radiates of Massachusetts Bay, I gave a sketch of an Euryale [2] in its natural attitude standing on tip toe, as it were, with its disk swelling to the fullest capacity, thus supporting the whole weight upon comparatively small numbers of the slenderest joints of the extremity of the arms, showing how nearly equal to the specific gravity of the water it must be, so that by slightly pushing it and producing a current, it will actually float, and then slowly settle again to the bottom. This will account for the frequency with which our fishermen bring up Astrophyton on their

[1] Agassiz, A. On the Embryology of Echinoderms. From Mem. Am. Acad., IX, p. 9.

[2] Seaside studies in Natural History. Fig, 151, p. 118. Boston, 1865. Marine Animals of Massachusetts Bay. Radiates. By El. and Alex. Agassiz.

lines; they meet them floating about a short distance above the bottom of the sea. The Astrophyton is not as sensitive to disturbance as the starfishes are; hence in the same experiment made with a starfish, the animal would be more likely to sink if disturbed when expanded. The solid limestone shell of these Echinoderms is not so solid at it looks; a section made across the plates of an Echinus, of an Ophiuran or starfish, still reveals to us the original mode of building up of this limestone structure, so apparent in the younger stage of the Echinoderms, which is nothing but a system of net work of limestone meshes, becoming closer and closer as the animal grows older; and still leave, even in the adult, an immense area for the absorption of the water which all these animals are able to draw into their cavities, and must permeate all their interstices, thus equalizing the pressure to which they must be subject at great depth, by thus penetrating everywhere, and permeating every part of their frame. The large percentage of water which starfishes and sea-urchins are capable of taking into their cavity, is shown by the following figures, made up by weighing fully expanded Echinoderms which have been in water a considerable time, and then weighing them again after they had been exposed to the air, but without allowing them to dry.

The average loss of thirty-three specimens of various sizes of *Asteracanthion berylinus* Ag., weighed as mentioned above, was .795 due to the water which the specimens lost when exposed to the air.

The average loss of seventeen specimens of *A. pallidus* Ag., was .815. The greater loss in this species is due to the greater flexibility and extensibility of the abactinal area than in the preceding species.

The average loss of eight specimens of *Toxopneustes drobachiensis* Ag., was .554.

When we come to other classes, such as the *Acalephæ*, the loss of water is still greater, being, on the average for our large *Aurelia flavidula* Ag., no less than .997, so that the jelly fishes seem nearly to be in the condition most favorable to resist great pressure, that of a spheroidal shell with an infinitely thin envelope suspended in the water at any depth it may be placed.

October 6, 1869.

The President in the chair. Forty-one members present.

Professor Spencer F. Baird, of Washington, D. C., was elected an Honorary Member.

Professor John Capellini, of Bologna, Col. E. B. Carling, U. S. A., and Mr. T. W. Higginson, of Newport, R. I., were elected Corresponding Members.

The following gentlemen were elected Resident Members: Messrs. Charles Deane, Ruthven Deane, Edward Rawson and William Brewster, of Cambridge; Professor Ferdinand Bôcher, Dr. G. H. Bixby and Messrs. E. S. Tobey and P. S. Tobey of Boston.

The President read by title a paper on the Osteology and Myology of *Didelphys virginiana*, by Elliott Coues; with an appendix on the Brain, by Jeffries Wyman; this will be printed in full in the Memoirs.

The following papers were also presented:—

On a New Species of Pedipes from Tampa Bay, Florida. By Robert E. C. Stearns.

Pedipes naticoides Stearns. Shell resembling a tiny Natica; imperforate, globose, translucent, pale horn color; spire short, apex

obtuse; whorls four to four and a half, slightly flattened above; the upper whorls moderately elevated; body whorl nine tenths the length of the shell; suture strongly defined; surface ornamented with fine depressed revolving lines, crossed obliquely and regularly by sharply developed lines of growth; aperture longitudinal, suboval; the middle portion of the outer lip moderately tuberculately thickened within, and slightly pressed inwards, giving a somewhat angular outline to the upper part of its edge; parietal wall covered with shining callus and furnished internally with a strongly developed ridge or plait, which culminates in a prominent sub-acute tooth, projecting in the line of its obliquity

two fifths of the width of the aperture; columella showing two rather obtuse teeth or folds, the upper being the largest, with a sinuous sulcation at their bases, parallel to the outline of the columella, causing, together with the folds, an appearance resembling the thread of a screw, or the plaits in Cancellaria.

Length .11 inch. Breadth .06 inch.

Habitat: Littoral zone, Rocky point, Tampa Bay, western shore of Florida; found with other small species of mollusks upon the under side of clumps of "Coon oysters" at low water line. Two specimens, living, one adult, the other not quite developed.

This well marked species is the first of the genus found upon the eastern side of the Continent, and the fourth thus far detected in North America.

The late Prof. C. B. Adams obtained a species at Panama, *P. angulatus*, Mr. W. G. Binney described another, *P. lirata*, from Cape St. Lucas, and Dr. J. G. Cooper a third, *P. unisulcata*, from San Pedro, California; the species above described is more globose, and more delicate than either of the others.

For the excellent figure of *P. naticoides* I am indebted to the kindness of my friend, Mr. E. S. Morse.

Molluscan Fauna of New Haven. A critical review of all the Marine, Fresh Water and Land Mollusca of the region, with descriptions of many of the living animals and of two new species. Part I. Cephalopoda and Gasteropoda. By George H. Perkins, Ph.D.

New Haven Bay, in and about which most of the marine species mentioned in the following pages were collected, is an arm of Long Island Sound, nearly five miles long and, at the entrance, three broad.

Near the shore the water is shallow, and nowhere is the depth, at low tide, more than three fathoms. The average depth over the whole area is less than two fathoms.

Three small rivers, emptying into the bay, freshen the water and fill it with mud, which covers most of the bottom, and even where that is sandy there is more or less mud mingled with the sand.

Near the lighthouse, at the entrance of the bay, on the eastern side, and for a mile northerly, a low ridge runs near the water's edge, and on the western side, nearly opposite the lighthouse, are a few masses of rock of no great extent, which are together often

called Savin Rock, though the name belongs properly to the largest only. Everywhere else the shores are low, sandy and faced by broad mud flats. A few of the species were collected in the somewhat clearer and deeper water of the Sound, outside the bay. On account of the freshness and impurity of the water, many species are less brightly and beautifully colored, and smaller than in more favorable localities. Some genera, as Pecten, Ensatella and Hemimactra, which are very abundant north or south, are relatively uncommon and small, while others, as Macoma, grow very large. Deep water species are necessarily either wholly wanting, or occur only as dead shells thrown upon the beach by storms. The fauna of the region belongs about equally to the Acadian and Virginian faunæ.

Of the marine species enumerated, fifty occur north of Cape Cod, thirteen Dr. Packard reports from Labrador, eight are found in Greenland, according to Dr. Mörch, and eight are European. Fifty-one extend as far south as South Carolina, and some still farther. Thirty-seven are found in the Post Pliocene, twenty-six in the Pliocene, and nineteen in the Miocene. Of the sixty-five species found in the Sound, but not, as yet, in New Haven Bay, forty-nine are found north of Cape Cod, and nine on the Carolina shores, while others range both north and south.

The descriptions of the animals, and all measurements, are from living specimens, and the various parts are taken in their natural position. In bivalves the length is regarded as the distance from the siphonal end to the opposite.

In nomenclature the rules of the British Association are followed. The list of marine species embraces all that have hitherto been found in this place, and is the result of a careful examination of the whole region. It has been impracticable at this time to give as thorough study to the land and fresh water shells, though the list is believed to be tolerably complete. The sandy soil, trap and sandstone rocks of the region are not favorable to the growth of land shells. I am happy to express my sincere thanks to Professor A. E. Verrill for granting free use of the Yale College collection, for freely giving his personal assistance at all times, and for identifying the Polyzoa. I am also indebted to Dr. E. T. Nelson and Mr. H. S. Williams for the use of their collections.

The following works are referred to in the Synonymy :—

Systema Naturæ. Linné. 12th ed. 1767.

Animaux sans Vertèbres. Lamarck. 12th ed. Paris, 1843.

Invertebrata of Massachusetts. Gould. Cambridge, Mass., 1841.

Say's American Conchology, Binney's edition. New York, 1859.

Natural History of New York. Zoölogy. Part I, Mollusca. De Kay. Albany, 1843.

Genera of Recent Mollusca. H. &. A. Adams. London, 1858.

Monograph of the Limniades and other Fresh Water Univalve Shells of North America. Haldeman. Philadelphia, 1844.

Land and Fresh Water Shells of North America. W. G. Binney. Smithsonian Institution, Washington, 1865. Parts II and III.

Iconographie des Coquilles Vivantes. Kiener. Paris, (no date).

Manuel de Conchyliologie. Chenu. Paris, 1859.

Revision of the Synonymy of the Testaceous Mollusks of New England, etc. Stimpson. Boston, 1851.

Check List of the Shells of North America. (East Coast). Stimpson. Smithsonian Institution, Washington, 1860.

Monograph of the American Corbiculidæ. Prime. Smithsonian Institution, Washington, 1865.

Manual of the Mollusca. Woodward. London, 1866.

Boston Journal of Natural History. 1834–1863.

Proceedings of the Boston Society of Natural History. Vol. IV, 1851.

Journal of the Portland Society of Natural History. Vol. I, 1864.

American Naturalist. Vol. I. Salem, Mass., 1867.

American Journal of Conchology. Vol. I. Philadelphia, 1865.

American Journal of Science and Arts. New Haven, Ct.

Journal of the Academy of Natural Sciences of Philadelphia.

Annals of the Lyceum of Natural History. Vol. VII. New York, 1859.

CEPHALOPODA.

Loligo Lamarck, 1799.

Loligo punctata De Kay, Moll. N. Y., p. 3, pl. i, fig. 1.

This is taken at times in considerable quantity in seines set near the entrance of the harbor, but it has, so far as I know, never been found on the shore. The egg clusters are occasionally found on the beach in June. They consist of a mass of long, cylindrical, jelly-like bodies, transparent and colorless, in which the oval, white ova

are imbedded. These are regularly arranged in longitudinal rows, there being usually six rows. The cases are fastened at one end, and taper from the free end till near the point of attachment, where they suddenly become quite small. There is a slight elevation of the surface over each ovum. The length is quite variable, average specimens being from 72 mill. to 95 mill. long. The diameter is about 6 mill. The ova are 2 mill. long and 1.2 mill. broad. Rarely the cases are attached at both ends.

GASTEROPODA.

MURICIDÆ.

UROSALPINX Stimpson, 1865.

Urosalpinx cinereus Stimpson, Am. Journ. Conch., Vol. I, pt. I, p. 58, pl. viii, figs. 6, 7. *Fusus cinereus* Say, Am. Conch., pp. 79, 184, pl. xxix, 1831; De Kay, Moll. N. Y., p. 145, pl. viii, fig. 184. *Rapana? cinerea* Stimpson's Check List. *Buccinum plicosum* Gould, Invert. Mass., p. 303, fig. 213.

Very abundant, especially on rocks near low water. Animal light yellow; tentacles short; eyes on outer side, about half way between the base and tip; foot rounded and notched behind, straight in front; operculum thin, corneous, ovate, chestnut brown. Teeth 1-1-1; lateral teeth simple, not much curved; median tooth broad, with three large denticles in the centre and several small ones each side.

MEASUREMENTS.

Length of shell	24.6	mill.	Breadth	15 mill.
" operculum	8.4	"	"	4.4
" foot	14.4	"	"	8.6 (before), 6.8 (behind).
" tentacles	5.4	"		

The ova capsules are attached in clusters to rocks, shells, etc., near low water; they are ovate, with short peduncle, broadest above, with the aperture in the centre of the upper margin; they are much flattened, arcuate, with a ridge running down each side; color, very light yellow. Ova 10–20, yellow; deposited in June. Height 6.4 mill.; greatest breadth 4 mill.; diameter 1.4 mill.; aperture 1.6 mill.

Eupleura H. & A. Adams, 1853.

Eupleura caudata H. & A. Adams, Gen. Rec. Moll., Vol. I, p. 107; Stimpson, Am. Journ. Conch., Vol. I, p. 58, pl. viii, fig. 5, 1865. *Ranella caudata* Say, Am. Conch., pp. 80, 200, pl. xlviii, 1822; Gould, Invert. Mass., p. 298, fig. cciv ; De Kay, Moll. N. Y., p. 139, pl. viii, fig. 176. *Triton caudata* Kien., Icon., pt. III, p. 6, pl. ix, fig. 2.

Not common. Laminarian, sometimes Littoral. I have found it alive several times, but have not seen it extended. The operculum is dark brown, ovate, strongly marked by concentric lines of growth; lingual ribbon long, narrow. Teeth 1-1-1; lateral teeth simple, curved; median tooth with three stout denticles and smaller ones each side.

COLUMBELLIDÆ.

Anachis H. & A. Adams, 1853.

Anachis avara. *Columbella avara* Say, Am. Conch., p. 76, 1822; Gould, Invert. Mass., p. 313, fig. 197; De Kay, Moll. N. Y., p. 139, pl. viii, fig. 179.

Occurs rarely alive, but dead shells are not very uncommon on the beach. A long, slender variety, with eight whorls, is sometimes found. The Messrs. Adams refer this shell to *Amycla*, as I think, wrongly.

Amycla H. & A. Adams, 1853.

Amycla lunata. *Nassa lunata* Say, Am. Conch., p. 122, 1826. *Buccinum lunatum* Gould, Invert. Mass., p. 312, fig. 196; De Kay, Moll. N. Y., p. 131, pl. vii, fig. 162.

Often found alive under stones, and on sea weeds at extreme low water, and dead in sand on the shore.

Amycla Gouldiana. *Columbella Gouldiana* Agassiz, MSS.; Stimpson, Shells of N. E., p. 47, 1851.

Occurs rarely with the preceding, of which it is probably only a variety.

Amycla dissimilis. *Columbella dissimilis* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 114, 1851; do. Shells of N. E., p. 47, 1851.

I discovered three fine specimens of this Northern species in a lot of *Amycla lunata*.

BUCCINIDÆ.

Fulgur Mont.

Fulgur carica Gill, Am. Jour. Conch., Vol. III, p. 145. *Murex carica* Linn., Gmel., 3545. *Pyrula carica* Gould, Invert. Mass., p. 296; De Kay, Moll. N. Y., p. 141, pl. ix, figs. 192–193.

This species is not common usually on shore, but sometimes it is abundant. It occupies the Laminarian zone, and most abounds near oyster beds, where it commits great ravages. Animal, large, dirty white to almost black; mantle thick, white, edge plain; proboscis long, cylindrical, slightly bilobed and black, or nearly so at the end, lighter next the body; tentacles short, triangular; eyes on the outer side near the base; gills two; one large, crescent-shaped, and below, and a little in front, one much smaller, curved, fusiform, grooved through the centre; the larger gill is narrower and thicker behind than before; foot large, oval, yellow below, blackish above, under surface much corrugated; verge very large and long, much flattened, pointed. Dentition 1-1-1; lateral teeth with a sharp curved outer denticle, then three shorter and more slender, and an inner stout triangular denticle; median tooth with 4–5 sharp conical denticles; the number of denticles varies in the same sex and even on the same ribbon at opposite ends. The operculum is ovate, thick, with a broad callus around the inner edge, which is heaviest on the left side; outer surface coarse and rough; color greenish yellow. The ova cases of this species consist of a series of membranous disks attached to a connecting cord of the same substance, forming a string; these strings are quite long, tapering somewhat at the ends; the disks are thin on the edge (the general thickness is about five mill.), broadly ovate, with eleven ribs, which radiate from the attached side and scallop the edge; opening opposite the point of attachment; color light yellow; filled with a colorless, thick, albuminous substance, in which float about sixty young. In a string forty-two centimetres long, there were seventy-five disks, whose average size was thirty-two mill. broad by twenty-two long. They are most common in March and April.

MEASUREMENTS.

Length of shell, ♀		122 mill.	Breadth	62 mill.
"	body	168 "		
"	large gill	36 "	"	9 "
"	small "	18.6 "	"	3.4 "
"	proboscis	27 "		
"	lingual ribbon	40 "	"	2 "
"	tentacles	18 "	"	4 " at base.

SYCOTYPUS Browne, 1846.

Sycotypus canaliculatus Gill, Am. Journ. Conch., Vol. III, p. 147. *Murex canaliculatus* Linn., Syst. Nat., 1222. *Busycon canaliculatum* Stimps., Smith. Check List. *Pyrula canaliculata* Lam., An. sans Vert., Vol. x, p. 504; Gould, Invert. Mass., p. 294, fig. 206; De Kay, Moll. N. Y., p. 140, pl. ix, fig. 190.

Common in the same localities as the preceding. It is not usually large, varies in color from light buff to dark, livid purple, and is not infrequently distorted; mantle white, edged with a narrow granulous cord of bright yellow color; proboscis long, black at the tip, reddish near the body, with a small fold just above the tip on one side; tentacles short, triangular, usually the right is much the smaller; eye spots on outer side about half way from the tips; foot large, ovate; operculum irregularly oval, thin, semitransparent, unless in a very old specimen, marked by strong lines of growth, brown, sometimes greenish; lingual ribbon long. Teeth 1-1-1; median tooth with three equal, slender, conical denticles; lateral teeth with a stout, much curved denticle on the outside, having on its inner base a small, sharp tubercle; next is a short, simple denticle, inside of which is one longer and broader, bifid at its tip, and inside a sharp, much curved one, bearing a sharp curved tubercle on its outer edge. Thus we have four denticles with seven points. Some of the tubercles are occasionally wanting. The ova cases of this species are similar to those of the preceding, but are smaller and do not have a sharp edge, but a narrow partition separates the surfaces. The surface is smooth, but the edge is crossed by twelve to fifteen ribs. A string fifty-seven cent. long had eighty-eight disks, twenty-three mill. by seventeen mill.; thickness three to four mill. Each disk has a circular opening two and four-fifths mill. in diameter on the middle of its lower edge. The number of young in each disk is about twenty-five, the average size of which, in April, is four mill. long and two and two-fifths mill. broad, and these were evidently nearly full grown. The eggs are laid two or three weeks later than those of *Fulgur carica.*

NASSIDÆ.

TRITIA Risso, 1826.

Tritia trivittata Conrad. *Nassa trivittata* Say, Am. Conch., p. 77, 1822. *Buccinum trivitattum* Gould, Invert. Mass., p. 30; De Kay, Moll. N. Y., p. 132, pl. viii, fig. 165.

Common on shore dead. Laminarian. In most cases it is not banded, and is often covered with a greenish black coating. Animal dusky; rostrum long, cylindrical, recurved over the shell; tentacles slender, with the eyes on the outer side a third of the distance above the base; above the eyes the tentacles become abruptly smaller; foot large, ovate, auricled in front and round pointed and notched behind, with a tentacular process on each side; lingual ribbon rather short. Teeth 1-1-1; median tooth arched, bearing nine sharp, slender denticles, the central being longest; lateral teeth short, broad, claw-shaped, with two denticles.

MEASUREMENTS.

Length of shell	17.4 mill.	Breadth	8.6 mill.	
" foot	10.6 "	"	7 "	
" tentacles	5 "	"	1.2 "	at base.

ILYANASSA Stimpson, 1865.

Ilyanassa obsoleta Stimps., Am. Journ. Conch., Vol. I, p. 60, pl. ix, figs. 11, 12. *Nassa obsoleta* Say, Am. Conch., p. 77, 1822. *Buccinum obsoletum* Gould, Invert. Mass., p. 208; De Kay, Moll. N. Y., p. 133, pl. viii, fig. 163. *Buccinum oliviformis* Kien., Icon., pt. II, p. 20, pl. xxv, fig. 99.

Very abundant, covering large tracts of mud near low water, and washed ashore in great numbers. Animal dark; proboscis rather long; tentacles acutely triangular, short, eye spots near the outer base; foot straight in front, slightly auricled; round pointed behind, white, thickly mottled with black; operculum small, oval, thin, corneous, lines of growth not prominent. Teeth 1-1-1; median much arched, bearing numerous small denticles; lateral teeth with two denticles, the outer much the larger.

MEASUREMENTS.

Length of shell	15.6 mill.	Breadth	10.4 mill.
" foot	16 "	"	9.2 "
" rostrum	9.4 "		
" tentacles	5 "		
" operculum	3 "	"	2.4 "

Ova capsules small, nearly sessile, oval, flattened; anterior and upper surface covered with a coarse network of sharp ridges forming facets of a somewhat quadrangular form, which extend to the edge forming points; posterior side smooth, as is the base; opening near

the centre of the top, a little below it, oval; capsule colorless, transparent, ova minute, white. Height two and three-fifths mill.: breadth in the middle two and one-fifth mill.; breadth of base one mill. Laid in April and May.

NASSA Lam., 1799.

Nassa fretensis[1] nov. sp.

Shell solid, short, obese, whorls six, undulated by prominent costæ, of which there are fifteen or sixteen on the body whorls and fewer on the upper whorls, vanishing near the apex; near the outer lip they are wanting, or quite faint; on the lower part of the body whorl the costæ are nearly straight and oblique; near the suture they make an angle bending towards the left; the costæ are cancellated by ten or twelve elevated lines; suture distinct; whorls slightly shouldered; aperture oval; lip much thickened by a large varix, and toothed within by about four lamellar teeth; pillar lip arched by a moderately thick callus, which scarcely extends above the aperture, and bears inside near the top a single tubercle; spire short, conical; canal very short, curved; color dark purplish brown with a yellowish band around the upper part of the body whorl, which is continued around the middle of the upper whorls; terminal whorls and upper part of the lip and lower half of the columella greenish yellow; interior usually purplish brown. Length fifteen mill. (.6 in.); breadth ten mill. (.4 in.). Not common. This shell has heretofore undoubtedly been confounded with *Nassa vibex* Say, which it resembles; but the spire is less acute, its ribs more numerous and narrower, its revolving lines more prominent, the callus much thinner and smaller, and the color much darker. It has also been found near Salem, Mass.

CERITHIOPSIDÆ.

CERITHIOPSIS Forbes and Hanley, 1849.

Cerithiopsis Emersoni Stimps., Check List. *Cerithium Emersoni* Gould, Invert. Mass., p. 275, fig. 180; De Kay, Moll. N. Y., p. 129, pl. viii, fig. 168.

Very rare; only dead shells were found.

[1] *Fretum*, a sound, and *ensis*, locative ending.

TRIFORIS Deshayes, 1825.

Triforis nigrocincta Stimps., Check List. *Cerithium nigrocinctum* Gould, Invert. Mass., p. 277, fig. 182; De Kay, Moll. N. Y., p. 129.

Very rare.

NATICIDÆ.

LUNATIA Gray, 1847.

Lunatia heros Stimps., Check List. *Natica heros* Say, Am. Conch., p. 86, 1822; Gould, Invert. Mass., p. 233, fig. 165; De Kay, Moll. N. Y., p. 120, pl. vii, figs. 148, 149.

Laminarian, not common.

Lunatia triseriata Stimps., Check List. *Natica triseriata* Say, Am. Conch., p. 121, 1826; Gould, Invert. Mass., p. 233, fig. 165; De Kay, Moll. N. Y., p. 121, pl. vii, fig. 144.

Quite rare and small. The teeth are similar to those of *Neverita*, but the middle denticle of the median tooth is proportionally much longer than the others. The second lateral tooth is broader than the outer, and both are less curved than in *Neverita*, and the inner lateral tooth has fewer denticles.

NEVERITA Risso, 1826.

Neverita duplicata Stimps., Check List. *Natica duplicata* Say, Am. Conch., p. 85, 1822; Gould, Invert. Mass., p. 236, figs. 163, 164; De Kay, Moll. N. Y., p. 121, pl. vii., fig. 147.

Laminarian. Most common near the shore in shallow water, where it burrows in the sand. It occurs quite large, some specimens being sixty-eight mill. (2.7 in.) high and sixty-seven mill. (2.6 in.) broad; but the average size here is about half this. The animal is very large, of a dirty white color; the head is covered by a fold from the upper part of the foot; tentacles short, flat, triangular, usually edged with black, unequal; eyes wanting; foot very large, perforate with minute openings, from which, when disturbed, the animal throws water; round, ruffled on the edge, much corrugated beneath; operculum semicordate, corneous, with distinct spiral lines of growth, which are crossed at right angles by faint radiating curved lines; lingual ribbon moderately long. Teeth 3-1-3; median tooth with three rather short triangular denticles, the central a little the longest; in-

ner lateral teeth broad and serrate at the tip, with one large, triangular denticle; outer lateral teeth simple.

MEASUREMENTS.

Length	of shell	27	mill.	Breadth	30 mill.	
"	foot	56	"			
"	tentacles	11	"	"	3.2 mill. at base.	
"	operculum	20	"	"	13	"

The large urn-shaped egg masses of this species, composed of ova and agglutinated sand, are found most frequently in April and May.

SCALARIADÆ.

Scalaria Lam., 1801.

Scalaria multistriata Say, Am. Conch., pp. 19 and 180, pl. xxvii, 1826; Gould, Invert. Mass., p. 251; De Kay, Moll. N. Y., p. 126.

Very rare.

Scalaria lineata Say, Am. Conch., pp. 83 and 180, pl. xxvii, 1822; Gould, Invert. Mass., p. 251; De Kay, Moll. N. Y., p. 126, pl. vi, fig. 125; Chenu, Man. de Conch., Vol. I, p. 217.

One of the rarest species found here. The only specimens I know of were collected by Prof. A. E. Verrill and Dr. E. T. Nelson.

PYRAMIDELLIDÆ.

Odostomia Flem., 1848.

Odostomia bisuturalis Stimps., Check List, 1860. *Chemnitzia bisuturalis* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 16, 1851. *Turritella bisuturalis* Say, Am. Conch., p. 84, 1822. *Jamina exigua* Couth., Bost. Journ. Nat. Hist., Vol. II, p. 92. *Odostomia exigua* Gould, Invert. Mass., p. 272, fig. 177.

Not uncommon on rocks and timber near low water. Animal white; tentacles not long, triangular, tapering to a blunt point; eyes between, and a little behind the tentacles; rostrum short, rounded in front; foot long and narrow, straight before and slightly auricled, rounded behind, contracted in the middle; operculum corneous, straw colored.

MEASUREMENTS.

Length of shell	4 mill.	Breadth	1.6 mill.
" foot	1.25 "	"	.8 "
" tentacles	1.2 "		

Odostomia dealbata Stimps., Check List. *Chemnitzia dealbata* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 114; do., Shells of N. E., p. 41.

Very rare. I have never found it alive.

Odostomia fusca Gould, Invert. Mass., p. 270, fig. 176; De Kay, Moll. N. Y., p. 116, pl. xxxvi, fig. 342. *Pyramis fusca* C. B. Adams, Bost. Journ. Nat. Hist., Vol. II, p. 282. *Chemnitzia fusca* Stimps., Shells of N. E., p. 41.

Not uncommon under stones near low water. Animal purple; rostrum as long as the tentacles, bilobed at the end; tentacles short, tapering; eyes on their inner bases; foot auricled and straight before, rounded behind, whitish below, having a dark line across the front, and for a short distance down each side. The animal often floats on the surface with the extended foot uppermost.

MEASUREMENTS.

Length of a small shell	2.8 mill.	Breadth	1.4 mill.
" foot	2.2 "	"	1.4 "
" tentacles	.6 "		

Odostomia impressa Stimps., Check List. *Turritella impressa* Say, Am. Conch., p. 84, 1822. *Odostomia insculpta* De Kay, Moll. N. Y., p. 115, pl. xxxi, fig. 297.

Not common.

Odostomia producta Gould, Invert. Mass., p. 270, fig. 175; De Kay, Moll. N. Y., p. 116, pl. xxxi, fig. 296. *Jamina producta* C. B. Adams, Bost. Journ. Nat. Hist., Vol. III, p. 322, pl. iii, fig. 8. *Chemnitzia producta* Stimps., Shells of N. E., p. 41.

Rarer than the preceding, with which it is found. The animal is purple, lighter than *O. fusca*; rostrum much expanded, bilobed in front, grooved along the middle; tentacles short, triangular, bases connate behind; foot auricled before, rounded and broader behind.

Odostomia seminuda Gould, Invert. Mass., p. 273, fig. 178. *Jamina seminuda* C. B. Adams, Bost. Journ. Nat. Hist., Vol. II, p. 280; *Chemnitzia seminuda* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 16.

Very rare.

Odostomia trifida Gould, Invert. Mass., p. 274, fig. 179; De Kay, Moll. N. Y., p. 114, pl. viii, fig. 178. *Actæon trifidus* Totten, Am. Journ. Sci., Vol. XXVI, p. 368, pl. i, fig. 4.

This species is more common than any of the others. It occurs under stones and among algæ near low water. The animal is very similar to that of *O. bisuturalis*.

TURBONILLA Risso, 1826.

Turbonilla interrupta Stimps., Check List. *Turritella interrupta* Totten, Am. Journ. Sci., Vol. XXVIII, p. 352; Gould, Invert. Mass., p. 268, fig. 173; De Kay, Moll. N. Y., p. 112, pl. vi, fig. 123.

Rare. Occurs under stones at the Lighthouse and Savin Rock, near low water.

Turbonilla nivea Stimps., Check List. *Chemnitzia nivea* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 114, 1851.

Only three or four dead specimens were found.

PLEUROTOMIDÆ.

PLEUROTOMA Lam., 1799.

Pleurotoma cerinum Kurtz & Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 115; Stimps., Shells of N. E., p. 49, pl. ii, fig. 2.

Only four or five specimens of this species have been found—all of them dead.

Pleurotoma brunnea nobis. *Pleurotoma plicata* C. B. Adams, Bost. Journ. Nat. Hist., Vol. III, p. 318, pl. iii, fig. 6; Gould, Invert. Mass., p. 282, fig. 187; De Kay, Moll. N. Y., p. 150, pl. iv, fig. 120.

I have found only one specimen of this shell; this was in a pile of shells thrown up by the waves. As Prof. Adams' name is preoccupied by Lamarck (see An. sans Vert., 12th ed., Vol. IX, p. 371), I propose that given above.

TEREBRIDÆ.

HASTULA H. & A. Adams, 1853.

One rather worn specimen was found by Prof. Verrill, which I refer to this genus. It seems to be new, but is not so perfect as to warrant a description.

OVULIDÆ.

Simnia H. & A. Adams, 1853.

Simnia uniplicatula Adams, Gen. Rec. Moll., Vol. I, p. 373. *Volva uniplicatula* Chenu, Man. Conch., Vol. I, p. 273, fig. 1802, et al. auct.

Dr. Nelson found a single specimen of this shell, which was probably brought on southern oysters, or in ballast.

CALYPTRÆIDÆ.

Crepidula Lam., 1799.

Crepidula convexa Say, Am. Conch., p. 75, 1822; Gould, Invert. Mass., p. 160; De Kay, Moll. N. Y., p. 158, pl. vii, fig. 131.

Littoral and Laminarian. Abundant, especially on *Ilyanassa obsoleta*. Animal dusky; rostrum nearly as long as the tentacles, which are short, cylindrical, tapering, bearing the eyes on the outer base; foot round behind, auricled before, longitudinally creased. This species is much more active than the two others.

MEASUREMENTS.

Length of shell	11.6 mill.	Breadth	7.4 mill.	
" foot	7 "	"	4 "	
" tentacles	3 "	"	of rostrum 1.6 mill.	

Crepidula fornicata Lam., An. sans Vert., Vol. VII, p. 641; Say, Am. Conch., p. 73, 1822; Gould, Invert. Mass., p. 158, fig. 17; De Kay, Moll. N. Y., p. 157, pl. vii, figs. 152 and 154. *Patella fornicata* Linné, Syst. Nat., 1257.

Very common, varying greatly in form and color in different stations. It occupies the same zone with the preceding. Animal usually white; mantle dark, edged with a simple yellow cord; rostrum deeply bilobed, lobes round, yellow; tentacles blunt at the ends, short, eyes on the outer base; foot broadly oval, dark on the edge, round behind; in front bearing a long curved auricle on each side; lingual ribbon short and broad. Teeth 3-1-3; median tooth with a central triangular denticle and a smaller one each side, the edges of which are finely serrate; inner lateral tooth broad at the end, and serrate with numerous small denticles; outer teeth simple, long, curved.

MEASUREMENTS.

Length of shell		28.8 mill.	Breadth 26 mill.	Height 19 mill.
"	foot	21 "	" 19 "	
"	tentacles	3.4 "		
"	lobes of head	2.4 "	" 2.2 "	
"	branchial plume	22.6 "		

Branchial plume covered by the mantle, dark brown. The eggs are laid in May. The ova cases are attached in a rosette-like cluster of about thirty, by long slender filaments. The capsules are triangular, thick, colorless, about two thirds filled with minute yellow ova. Length four and one-fifth mill.; breadth four mill.; thickness two and four-fifths mill. Peduncle four mill. long.

Crepidula unguiformis Lam., An. sans Vert., Vol. VII, p. 643. *Crepidula plana* Say, Am. Conch., p. 74, pl. xliv, 1822; Gould, Invert. Mass., p. 159, fig. 76; De Kay, Moll. N. Y., p. 158, pl. vii, fig. 153.

Very common, often completely lining old shells, and also on the outside. I have taken nearly two hundred from a single shell of *Fulgur*. The young are usually found on the older ones. The lack of convexity is very constant. Animal white; rostrum short, broad, bilobed; tentacles short, obtusely pointed, semitransparent, white at the tips; foot ovate, a little more than half as long as the shell, concave before, auricled, round behind; ova capsules in clusters like the preceding; capsules broadly triangular, thin, transparent, about forty in each cluster; ova light yellow, clustered about the upper edge and along the sides, leaving the centre free, and usually the lower part. Length two and one-fifth mill.; breadth three mill.; thickness one and one-fifth mill. Length of peduncle four and three-fifths mill.

These capsules are similar to those of *C. fornicata*, but are broader, shorter, and thinner, and the ova are differently situated. Laid in June.

RISSOIDÆ.

Sub-Family Rissoinæ Stimps., 1865.

Rissoa Fleming, 1814.

Rissoa aculeus Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 15. *Cingula aculeus* Gould, Invert. Mass., p. 266, fig. 172; De Kay, Moll. N. Y., p. 110, pl. vi, fig. 115.

Common under stones and on algæ near low water.

Rissoa minuta Stimps., Shells of N. E., p. 33. *Turbo minuta* Totten, Am. Journ. Sci., Vol. XXVI, p. 369. *Cingula minuta* Gould, Invert. Mass., p. 265, fig. 171; De Kay, Moll. N. Y., p. 110, pl. iv, fig. 117.

Very common in a few limited localities.

Rissoella? eburnea Stimps., Check List. *Rissoa eburnea* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 14; do. Shells of N. E., p. 34, pl. i, fig. 1.

Not common.

CINGULA Flem.

Cingula lævis De Kay, Moll. N. Y., p. 111, pl. vi, fig. 118.

Quite common.

Sub-Family SKENEINÆ Stimps., 1865.

Skenea planorbis Forb. and Han., Brit. Moll.; Stimps., Shells of N. E., p. 35. *Skenea serpuloides* Gould, Invert. Mass., p. 247, fig. 189; De Kay, Moll. N. Y., p. 117, pl. xxxii, fig. 303.

Littoral, occurring with *Alexia myosotis*. Not common.

Sub-Family HYDROBIINÆ Stimps., 1865.

AMNICOLA Gould & Hald., 1839.

Amnicola limosa Hald., Monog., p. 10, pl. i, figs. 5 and 6, 1844; W. G. Binney, Shells of N. A., pt. III, p. 84, fig. 166. *Paludina porata* Say, Am. Conch., p. 61, 1819. *Amnicola porata* Gould, Invert. Mass., p. 229, fig. 157.

Not common. It occurs in West River and Harris' pond, near New Haven.

Amnicola porata Hald., Monog., p. 13, pl. i, fig. 8; W. G. Binney, Shells of N. A., pt. III, p. 83, fig. 164; De Kay, Moll. N. Y., p. 88, pl. xxxv, fig. 33. *Paludina porata* Say, Am. Conch., p. 69, 1821.

More common than the preceding. Occurs in the same localities.

Sub-Family POMATIOPSINÆ Stimps., 1865.

POMATIOPSIS.

Pomatiopsis lapidaria Tryon, Proc. Phil. Acad., 1862; W. G. Binney, Shells of N. A., pt. III, p. 93, fig. 188; Hald., Monog., p. 18, pl. i, fig. 10 *Paludina lapidaria* Say, Am. Conch., p. 56, 1819.

Rare. Only a very few specimens found.

LITTORINIDÆ.

Littorina Ferussac, 1821.

Littorina palliata De Kay, Moll. N. Y., p. 106, pl. vi, fig. 10. *Turbo palliatus* Say, Am. Conch., p. 82, 1822. *Littorina littoralis* (Forbes & Han.) Stimps., Shells of N. E., p. 33.

Littoral, common on stones near low water, and on algæ. Animal varying in color from white to black; tentacles usually dark, rarely light, tapering, broad; eyes on their outer bases; foot oval or round; operculum thin, oval, with concentric lines of growth. The animal is very active, the tentacles are constantly in motion, and the pulsations in the head plainly visible.

MEASUREMENTS.

Length of shell	6	mill.	Breadth	8	mill.
" foot	7.6	"	"	3	"
" tentacles	4	"			
" operculum	4	"	"	.6	"

Littorina rudis Gould, Invert. Mass., p. 257, fig. 165; De Kay, Moll. N. Y., p. 104, pl. v, fig. 103. *Turbo rudis* Montagu, Test. Brit. *Turbo obligatus* Say, Am. Conch., p. 82, 1822.

Common with the preceding. Animal dark; tentacles slender, pointed, black above, lighter below; eyes on the outer bases; rostrum black, two thirds as long as the tentacles; foot whitish beneath, dusky above, longitudinally grooved; operculum horny, oval, with spiral lines of growth; lingual ribbon very long and narrow; ova hatched within the animal; young shells flat, with very wide aperture, corneous.

MEASUREMENTS.

Length of shell	10	mill.	Breadth	8	mill.
" foot	7.6	"	"	3.6	"
" operculum	4	"	"	3.2	"
" tentacles	3.2	"			

Littorina irrorata De Kay, Moll. N. Y., p. 106, pl. vi, fig. 105. *Turbo irroratus* Say, Am. Conch., p. 81, 1822. *Phasianella sulcata* Lam. (teste Stimpson).

Not at all common.

LACUNIDÆ.

Lacuna Turton, 1827.

Lacuna vincta Gould, Invert. Mass., p. 262, fig. 178; De Kay,

Moll. N. Y., p. 111, pl. vi, fig. 119. *Turbo vinctus* Montagu, Test. Brit.

Not very common. The fuscous variety is rare.

PALUDINIDÆ.

Melantho Bowditch, 1822.

Melantho decisa Binney, Shells of N. A., part 3, p. 41, figs. 79–84. *Paludina decisa* Say, Am. Conch., p. 49, pl. x; Hald., Monog., p. 4, pl. i; Gould, Invert. Mass., p. 22, fig. 144. (*Vivipara decisa* Gill, Proc. Phil. Acad.)

Common in all ponds and streams, but small and usually much eroded.

VALVATIDÆ.

Valvata Gray, 1840.

Valvata tricarinata Adams, Am. Journ. Sci., Vol. xl, p. 267; Gould, Invert. Mass., p. 125, fig. 156; De Kay, Moll. N. Y., p. 118, pl. vi, fig. 130; Binney, Shells of N. A., pt. iii, p. 9, fig. 13. *Valvata unicarinata* De Kay, Moll. N. Y., p. 118, pl. vi, fig. 129.

Common in all ponds and streams.

Valvata sincera Say, Am. Conch., p. 130, pl. lxxiv, fig. 11, 1824; Hald., Monog., p. 6, pl. i, figs. 5–10; De Kay, Moll. N. Y., p. 119, pl. vi, figs. 127, 128; Binney, Shells of N. A., pt. iii, p. 12, fig. 17.

This species is quite rare. I have found it only in Harris's pond, a mile and a half west of New Haven. The animal is dark; tentacles slender, sharply pointed, white, with a dark line through the middle; eyes on the inner bases; rostrum short, round at the end; foot oblong, narrow, rounded behind, bilobed before.

CERITHIADÆ.

Bittium Leach, 1847.

Bittium nigrum Stimps., Check List. *Pasithea nigra* Totten, Am. Journ. Sci., Vol. xxvi, p. 369, pl. i, fig. 7. *Cerithium reticulatum* Totten, Am. Journ. Sci., Vol. xxviii, p. 352. *Cerithium Sayii* Gould, Invert. Mass., p. 278, fig. 183; De Kay, Moll. N. Y., p. 128, pl. viii, fig. 167.

Common on algæ near low water. Full grown shells are much less common than young ones. Animal small, purplish; rostrum rounded, about half as long as the tentacles, deeply bilobed; tentacles slender, white, banded with dark purple, tapering but little; eyes on short pedicels connate with the outer bases of the tentacles; foot light below, spotted with purple, dark above, long and narrow, obtusely pointed behind, expanded in front; operculum thin, corneous, ovate, with a circular thickened upper part, marked with spiral lines of growth, and a sub-triangular and thinner lower part.

MEASUREMENTS.

Length of shell		5	mill.	Breadth 2 mill.
"	tentacles	1.6	"	
"	foot	3		
"	operculum	1.6	"	

Bittium Greenii Stimps., Check List. *Cerithium Greenii* C. B. Adams, Bost. Journ. Nat. Hist., Vol. II, p. 287, pl. iv, fig. 12; Gould, Invert. Mass., p. 279, fig. 184; De Kay, Moll. N. Y., p. 130.

Very rare.

ACMÆIDÆ.

TECTURA Audouin, 1830.

Tectura testudinalis Stimps., Check List. *Patella testudinalis* Müll. *Patella amœna* Say, Am. Conch., p. 73, 1822. *Patelloida amœna* Couthouy, Bost. Journ. Nat. Hist., Vol. II, p. 171. *Patelloida testudinalis* De Kay, Moll. N. Y., p. 162, pl. xix, fig. 196. *Lottia testudinalis* Gould, Invert. Mass., p. 153, fig. 12.

Very rare. I am indebted for the only specimen that I have seen from here to Mr. Geo. Williams. It is much more conical, and the apex farther forward than most of those from farther north. Animal oval, white; mantle not extending beyond the edge of the shell, fringed with rather long, uneven papillæ, light blue, with a darker line around the edge; rostrum short, rounded; tentacles moderately long, tapering, blunt at the ends, setose along the sides, bluish hyaline white, with an opaque white line through the centre, barred with broad lines of the same, when contracted curved about the rostrum; eyes on the outer bases; branchial plume white, longer than the tentacles, tapering gradually from the base, lamellæ longest behind the midrib, arcuate; foot ovate, pointed behind, when contracted folded longitudinally upon itself; lingual ribbon long and narrow.

MEASUREMENTS.

Length of shell	13	mill.	Breadth 10 mill.	Height 5 mill.
" foot	9	"	" 6 "	
" tentacles	5	"		
" branchial plume	6.2	"		

HELICIDÆ.

Mesodon Rafinesque, 1831.

Mesodon albolabris Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 8. *Helix albolabris* Say, Am. Conch., pp. 5, 21, 23, pl. xiii, 1816; Gould, Invert. Mass., p. 170, fig. 101; Morse, Am. Nat., Vol. I, pp. 16, 96, pl. i, fig. 2.

Common.

Stenotrema Rafinesque, 1819.

Stenotrema monodon Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 10. *Helix monodon* Rackett, Linn. Trans.; Gould, Invert. Mass., p. 174, fig. 113; Morse, Am. Nat., Vol. I, p. 151, figs. 12, 13.

Not common. Professor Verrill has collected a few specimens.

Stenotrema hirsuta Tryon, Am. Journ. Conch., Vol. III. *Helix hirsuta* Say, Am. Conch., pp. 7, 8, 21, 1817; Gould, Invert. Mass., p. 175, fig. 116; Morse, Am. Nat., Vol. I, p. 151, figs. 14, 15.

Common.

Anguispira Morse, 1864.

Anguispira alternata Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 11. *Helix alternata* Say, Am. Conch., pp. 6, 21, 31, 1816; Gould, Invert. Mass., p. 177, fig. 114; Morse, Am. Nat., Vol. I, p. 187, figs. 17, 18.

Quite rare.

Hyalina Agassiz, 1837.

Hyalina arborea Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 14. *Helix arborea* Say, Am. Conch., p. 31, 1824; Gould, Invert. Mass., p. 182, fig. 110; Morse, Am. Nat., Vol. I, p. 542, fig. 30.

Common in damp woods.

Hyalina electrina Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 13. *Helix electrina* Gould, Invert. Mass., p. 183, fig. 111; Morse, Am. Nat., Vol. I, p. 542, fig. 31.

Collected by Prof. Verrill. Quite rare.

PSEUDOHYALINA Morse, 1864.

Pseudohyalina exigua Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 16. *Helix exigua* Stimps., Proc. Bost. Soc. Nat. Hist., Vol. III, p. 175; Morse, Am. Nat., Vol. I, p. 543, fig. 34.

Collected at Stony Creek by Prof. Verrill. Rare.

Pseudohyalina minuscula Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 16. *Helix minuscula* Binney, Bost. Journ. Nat. Hist., Vol. III, p. 435; Morse, Am. Nat., Vol. I, p. 543, fig. 35.

Rare.

VALLONIA Risso, 1826.

Vallonia minuta Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 21. *Helix minuta* Say, Am. Conch., pp. 7, 10, 21, 1817; Morse, Am. Nat., Vol. I, p. 544, fig. 39.

Common about the roots of elms on the College grounds.

STROBILA Morse, 1864.

Strobila labyrinthica Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 26. *Helix labyrinthica* Say, Am. Conch., pp. 7, 10, 21, 1817; Gould, Invert. Mass., p. 184, fig. 106; Morse, Am. Nat., Vol. I, p. 545, figs. 41, 42.

HELICODISCUS Morse, 1864.

Helicodiscus lineata Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 25. *Helix lineata* Say, Am. Conch., pp. 7, 9, 24, 1817; Gould, Invert. Mass., p. 179, fig. 103; Morse, Am. Nat., Vol. I, p. 546, fig. 44.

Common under stones in moist woods on West Rock.

SUCCINEA Drap., 1801.

Succinea avara Say, Am. Conch., p. 32, pl. lxxiv, fig. 6, 1824; Gould, Invert. Mass., p. 196, fig. 127; Morse, Am. Nat., Vol. I, p. 607, fig. 47.

Common in moist places.

Succinea ovalis Say, Am. Conch., pp. 7, 8, 22, 1817; Gould, Invert. Mass., p. 194, fig. 125; Morse, Am. Nat., Vol. I, p. 607, fig. 48. *Succinea obliqua* Say (not Gould), Am. Conch., p. 32.

Not uncommon.

PUPADÆ.

Leucochila Alb. and Mart.

Leucochila armifera Morse, Am. Nat., Vol. I, p. 667, fig. 55. *Pupa armifera* Say, Am. Conch., p. 21, 1821; Gould, Bost. Journn. Nat. Hist., Vol. III, p. 401.

Not common.

Leucochila pentodon Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 36. *Pupa pentodon* Morse, Am. Nat., Vol. I, p. 667, fig. 57; De Kay, Moll. N. Y., p. 50, pl. iv, fig. 48 and pl. xxxvi, fig. 337. *Vertigo pentodon* Say, Am. Conch., p. 27, 1822. *Pupa curvidens* Gould, Invert. Mass., p. 189, fig. 120.

Collected by Prof. Verrill on the College grounds. Common.

Isthmia Gray, 1821.

Isthmia ovata Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 38. *Vertigo ovata* Say, Am. Conch., p. 26, 1822; Morse, Am. Nat., Vol. I, p. 668, figs. 57, 58.

Not common.

Isthmia ventricosa Morse, Annals Lyceum Nat. Hist., N. Y., Vol. VIII, 1865. *Vertigo ventricosa* Morse, Am. Nat., Vol. I, p. 669, figs. 61, 62.

Very rare.

LIMACIDÆ.

Limax Lam., 1809.

Limax agrestis (Linn.) Binney, Bost. Journ. Nat. Hist., Vol. IV; De Kay, Moll. N. Y., p. 20, pl. i, fig. 4. *Limax tunicata* Gould, Invert. Mass., p. 3.

Not rare.

Limax campestris Binney, Bost. Journ. Nat. Hist., Vol. IV; De Kay, Moll. N. Y., p. 22.

Common.

Limax flavus (Linn.) Binney, Bost. Journ. Nat. Hist., Vol. IV; De Kay, Moll. N. Y., p. 21, pl. i, fig. 5. *Limax variegatus* Lam., An. sans Vert., Vol. III, p. 266.

Common in damp places in gardens.

ARION Ferussac, 1819.

Arion hortensis (Fer.) De Kay, Moll. N. Y., p. 23; Binney, Bost. Journ. Nat. Hist., Vol. IV, p. 10. *Limax hortensis* Lam., An. sans Vert., Vol. VII, p. 719.

Not common.

AURICULIDÆ.

CARYCHIUM Müll., 1774.

Carychium exiguum Stimps., Check List; Binney, Shells of N. A., pt. II, p. 6, figs. 5–9; Morse, Am. Nat., Vol. I, p. 671, fig. 69. *Pupa exigua* Say, Am. Conch., p. 26, 1822; Gould, Invert. Mass., p. 191, fig. 122.

Rare.

ALEXIA Leach, 1847.

Alexia myosotis Drap.; Binney, Shells of N. A., pt. II, p. 4, figs. 2–4; Morse, Am. Nat., Vol. I, p. 671, fig. 70. *Auricula denticulata* Gould, Invert. Mass., p. 199, fig. 129; De Kay, Moll. N. Y., p. 58, pl. v, fig. 91. *Auricula personata* Lam., An. sans Vert., Vol. VIII, p. 334. *Voluta denticulata* Montagu, Brit. Test.

Very abundant on the stone foundations of the bridge over West River, near West Haven, and on the piles. Animal white or dusky; rostrum long, broad, bilobed before; tentacles short, broad at the base, obtusely pointed, but I have seen none "bulbous at the tip" (vide Binney, loc. cit., p. 5), wrinkled, edge undulated by the wrinkles, with a black line along the edge; eyes on the inner bases; foot narrow, oblong, obtusely pointed behind, round before, margin undulated.

MEASUREMENTS.

Length of	shell	8.6 mill.	Breadth	3.8	mill.	
"	foot	6 "	"	2.2	"	
"	tentacles	1.2 "	"	.4	"	at base.

MELAMPUS Montfort, 1810.

Melampus bidentatus Say, Am. Conch., p. 84, 1822; Binney, Shells of N. A., pt. II, p. 10, figs. 11, 12; Morse, Am. Nat., Vol. I, p. 671, fig. 71. *Melampus corneus* Stimps., Shells of N. E., p. 51. *Melampus lineatus* Say, Am. Conch., p. 85, 1822 (var.) *Auricula*

bidentata Gould, Invert. Mass., p. 197, fig. 130; De Kay, Moll. N. Y., p. 57, pl. v, fig. 92.

Very abundant on walls near high water, in salt marshes, on piles of bridges, and other places above low water. It varies greatly in form and color. Animal dark brown or fuscous; tentacles cylindrical, a little tapering, not long; eyes on inner bases; foot oblong, rounded and notched behind; edge scalloped slightly, divided into three lobe-like segments; the first narrow, sub-crescent-shaped, notched in front; the second broader, trapezoidal; the third much the largest, straight in front, rounded behind and notched.

MEASUREMENTS.

Length of shell			8.6 mill.	Breadth	4.6 mill.
"	1st segment of foot		.8 "	"	3.2 "
"	2d "	"	1.6 "	"	4.2 "
"	3d "	"	5 "	"	2 "
"	tentacles		2.2 "		

LIMNÆIDÆ.

Lymnophysa Fitz., 1833.

Lymnophysa desidiosa Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 41. *Lymnæa desidiosa* Say, Am. Conch., pp. 66, 130, 211, pl. lv; Gould, Invert. Mass., p. 219, fig. 150; Hald., Monogr., p. 31, pl. x; Binney, Shells of N. A., pt. II, p. 48, fig. 68.

Common in ponds, especially in a small pond by the roadside near the *Lighthouse.*

Lymnophysa umbrosa Tryon, Am. Journ. Conch., Vol. III, p. 250. *Lymnophysa elodes* Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 41. *Lymnæus umbrosa* Say, Am. Conch., p. 168, pl. xxxi; De Kay, Moll. N. Y., p. 68, pl. iv, fig. 76. *Lymnæus elodes* Say, Am. Conch., pp. 66, 188. *Lymnæa elodes* Gould, Invert. Mass., p. 221, figs. 146, 147. *Lymnæus fragilis* De Kay, Moll. N. Y., p. 68, pl. iv, fig. 76. *Lymnæa palustris* (pars) Binney, Shells of N. A., pt. II, p. 44, fig. 60.

Common in most ponds. I have followed Mr. Tryon in placing the species commonly called *L. elodes* under *L. umbrosa*, as that seems to me to be its proper place.

NERISTOMA Tryon, 1865.

Neristoma columella Tryon, Am. Journ. Conch., Vol. I, p. 248. *Radix columella* Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 42. *Lymnæus columellus* Say, Am. Conch., p. 65, 1821. *Lymnæa columella* Gould, Invert. Mass., p. 215, fig. 144; Hald., Monogr., p. 38, pl. xii; do. var. *chalybea*, Gould, Invert. Mass., p. 216, fig. 145.

PLANORBIDÆ.

PLANORBIS Guet., 1756.

Planorbis lentus Say, Am. Conch., p. 210, pl. liv, fig. 1, 1834; Gould, Invert. Mass., p. 202, fig. 132; Hald., Monogr., p. 18, pl. iii, figs. 3–6; Binney, Shells of N. A., pt. II, p. 104, fig. 177.

Common everywhere.

PLANORBELLA Hald., 1842.

Planorbella campanulatus Binney, Shells of N. A., pt. II, p. 109, fig. 184. *Planorbis campanulatus* Say, Am. Conch., pp. 129, 164, 1821; Hald., Monogr., p. 9, pl. i, figs. 7–11; Gould, Invert. Mass., p. 204, fig. 133.

Not common.

MENETUS H. & A. Adams, 1853.

Menetus exacutus Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 41; Binney, Shells of N. A., pt. II, p. 126, fig. 210. *Planorbis exacutus* Say, Am. Conch., p. 64, 1821; Gould, Invert. Mass., p. 208, fig. 137; Hald., Monogr., p. 21, pl. iv, figs. 1–3.

Common in West River and Harris's Pond.

GYRAULUS Agassiz.

Gyraulus deflectus Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 41; Binney, Shells of N. A., pt. II, p. 129, fig. 215. *Planorbis deflectus* Say, Am. Conch., p. 128, pl. lxxiv, fig. 8, 1829; Hald., Monogr., p. 25, pl. IV, figs. 4–7; Gould, Invert. Mass., p. 207, fig. 136; De Kay, Moll. N. Y., p. 65.

Not very common.

Gyraulus dilatatus Morse., Journ. Port. Soc. Nat. Hist., Vol. I, p. 41; Binney, Shells of N. A., pt. II, p. 131, fig. 218. *Planorbis*

dilatatus Gould, Invert. Mass., p. 210, fig. 140; Hald., Monogr., p. 23, pl. iv, figs. 15–18; De Kay, Moll. N. Y., p. 66.

I have found this nowhere except in a small pond on Whitney Avenue, three quarters of a mile north of the city.

Gyraulus hirsutus Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 41. *Gyraulus albus* Binney, Shells of N. A., pt. II, p. 132, figs. 219–221. *Planorbis hirsutus* Gould, Invert. Mass., p. 206, fig. 135; De Kay, Moll. N. Y., p. 64. *Planorbis albus* Hald., Monogr., p. 29, pl. iv, figs. 8–10.

Common everywhere.

Gyraulus parvus Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 41; Binney, Shells of N. A., pt. II, p. 133, figs. 222–224. *Planorbis parvus* Say, Am. Conch., p. 45, pl. lxxix, fig. 5, 1816; Hald., Monogr., p. 27, pl. iv, figs. 19–23; Gould, Invert. Mass., p. 209, fig. 139; De Kay, Moll. N. Y., p. 66.

Common everywhere.

Planorbula Hald., 1842.

Planorbula armigera Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 40; Binney, Shells of N. A., pt. II, p. 137, fig. 229. *Planorbis armigerus* Say, Am. Conch., pp. 66, 129, 1821; Hald., Monogr., p. 30, pl. iv, figs. 11–15; Gould, Invert. Mass., p. 205, fig. 138; De Kay, Moll. N. Y., p. 62, pl. iv, fig. 64.

Not very common.

Physa Drap., 1807.

Physa ancillaria Say, Am. Conch., p. 114, 1825; Gould, Invert. Mass., p. 212, fig. 142; Hald., Monogr., p. 27, pl. iii, figs. 1–10; Binney, Shells of N. A., pt. II, p. 81, fig. 139. *Physa obesa* De Kay, Moll. N. Y., p. 78, pl. v, fig. 86.

Not very abundant.

Physa heterostropha Say, Am. Conch., pp. 68, 130, pl. lxix, fig. 6, 1821; Gould, Invert. Mass., p. 211, fig. 141; Hald., Monogr., p. 23, pls. i, ii, figs. 1–9.

Common in all streams and many ponds.

Bulinus Adanson, 1757.

Bulinus hypnorum Binney, Shells of N. A., pt. II, p. 99, fig. 170. *Physa hypnorum* (Linné) Hald., Monogr., p. 36, pl. v, figs. 4–9;

Nauta elongata Morse, Journn. Port. Soc. Nat. Hist., Vol. I, p. 44; *Physa elongata* Say, Am. Conch., p. 68, 1821; Gould, Invert. Mass., p. 214, fig. 143; De Kay, Moll. N. Y., p. 81, pl. xxxvi, fig. 346; *Aplexus hypnorum* Chenu, Man. Conch., Vol. I, p. 481, fig. 3555.

Rare.

Ancylus Geoffr., 1767.

Ancylus fuscus Adams, Bost. Journ. Nat. Hist., Vol. III, p. 329, pl. iii, fig. 17; Gould, Invert. Mass., p. 224, fig. 152; Binney, Shells of N. A., pt. II, p. 140, fig. 203.

Rather common. Animal flesh-color mottled with black; tentacles long, slender, cylindrical, broad just at the base, bearing the eyes on their inner bases; hyaline white, with a black line through the centre; rostrum somewhat bilobed; foot oblong-oval, rather large; branchial plume triangular on the left side.

MEASUREMENTS.

Length of shell	7.8 mill.	Breadth 5.4 mill.	Height 1.8 mill.
" foot	4.4 "	" 3 "	
" tentacles	2.6 "		
" branchial plume	2.2 "		

Ancylus rivularis Say, Am. Conch., p. 60, 1817; Gould, Invert. Mass., p. 224, fig. 153; Binney, Shells of N. A., pt. II, p. 142, fig. 238.

Not common.

TORNATELLIDÆ.

Tornatella Lam., 1812.

Tornatella puncto-striata C. B. Adams, Bost. Journ. Nat. Hist., Vol. III, p. 323, pl. iii, fig. 9; Gould, Invert. Mass., p. 245, fig. 188; De Kay, Moll. N. Y., p. 127, pl. vii, fig. 143.

Not common. Occurs dead on the beach with *Bulla*.

CYLICHNIDÆ.

Cylichna Lovén, 1846.

Cylichna oryza Stimps., Check List. *Bulla oryza* Totten, Am. Journ. Sci., Vol. XXVIII, p. 35; Gould, Invert. Mass., p. 168, fig. 93; De Kay, Moll. N. Y., p. 18, pl. xxxv, fig. 327.

Very rare. Occurs dead on the beach.

UTRICULUS Brown, 1829.

Utriculus canaliculatus Stimps., Check List. *Bullina canaliculata* Say, Am. Conch., p. 60, pl. xxxix, 1832. *Bulla canaliculata* Gould, Invert. Mass., p. 166, fig. 97; De Kay, Moll. N. Y., p. 19, pl. xxxv, fig. 328; *Bulla obstricta* Gould, Invert. Mass., p. 167, fig. 96; De Kay, Moll. N. Y., p. 15, pl. v, fig. 96.

Not common.

BULLIDÆ.

BULLA Klein, 1753.

Bulla solitaria Say, Am. Conch., p. 84, 1822. *Bulla insculpta* Gould, Invert. Mass., p. 162, fig. 92; De Kay, Moll. N. Y., p. 14, pl. v, fig. 100.

Not common. Occurs on beaches facing mud flats covered with *Zostera*, or eel grass.

[Of the NUDIBRANCHIATA only one specimen has been found; it has not been determined.]

Mr. N. S. Shaler made a few remarks upon the changes in the geographical distribution of the American buffalo (*Bos americanus*). The mound builders of the West have preserved, in various forms, marks of their acquaintance with all the large mammals of the interior of the continent excepting the buffalo. In some late explorations in the "salt licks" of Kentucky, he had found bones of this animal in great abundance just below the recent mould, in a bed about eighteen inches thick; but, in the rich deposits of extinct mammals just beneath, immediately above which traces of worked flint were also found, no buffalo bones were discovered.

Mr. W. H. Dall stated that, in Alaska, near the great bend of the river Yukon, the bones of the musk ox and of a buffalo, indistinguishable, according to Professor Baird, from the American bison, are frequently found upon the surface of the ground, having still an animal odor about them. The

bones of a fossil elephant occur with them, but they are black and fragile. Yet the Indians and Esquimaux have neither knowledge nor tradition of any large animals save the reindeer and the moose.

The President read a letter from the Rev. R. C. Waterston, presenting a portrait and an autograph letter of Humboldt. The portrait was a copy, by Mr. Wight, of an original painting which he had made in 1852.

On motion of Mr. W. T. Brigham it was unanimously voted to present to Mr. Waterston the hearty thanks of the Society, not only for the valuable portrait and autograph, but for the unflagging energy with which he had labored for the success of the Humboldt Centennial Celebration.

Dr. S. Kneeland bore testimony to the untiring zeal of Mr. Waterston, showing that he had obtained much the greater portion of the subscriptions to the fund, and had, in addition, performed nine-tenths of the other work.

Rev. Mr. Waterston, after having acknowledged the favor with which the Society had received his efforts, read a report on behalf of the Committee appointed to arrange for the celebration, with a detailed acount of its proceedings. More than six thousand dollars had been raised by subscription for the Humboldt scholarship in the Museum of Comparative Zoölogy at Cambridge, and after all expenses were paid, at least one thousand dollars additional would be left from the sale of tickets.

The Chairman of the Committee was requested to express, on behalf of the Society, its sense of indebtedness to Professor Agassiz for his able address, and to request a copy for publication.

The thanks of the Society were also voted to the Orpheus Musical Association, to Mr. Carl Zerrahn and to Mr. J. K. Paine for their welcome aid in carrying out their share of the celebration.

October 20, 1869.

The President in the chair. Twenty-eight persons present.

Dr. B. Joy Jeffries was appointed Secretary *pro tempore.*

Mr. W. H. Dall described the alluvial deposits of the Yukon River, in Alaska. Each annual layer is deposited in three strata—gravel, mud and vegetable matter, according to the specific gravity of the materials. In a bank near Nulato, in a space eight feet high, one hundred and eighty annual layers were counted. The vegetable matter in the lower layers showed signs of carbonization. Some intervals were noticeable where vegetation had attained a considerable growth before it was overwhelmed by another inundation. The roots and stumps were occasionally left *in situ*, the tops having been broken off and carried away.

A close parallelism was shown to exist between these Post Pliocene deposits and the adjacent Miocene Tertiary strata. In the latter the sandstones, though hard and often metamorphosed, were shown to consist of similar layers of sand, mud and vegetable material. Perhaps a more complete exemplification could not be shown of the theory that geological action is going on at the present time at about the same rate as in former ages. The manner and amount of deposition in the present and in the Tertiary epochs, were thus proved to be nearly identical.

Four entirely unspotted eggs of the *Corvus americanus*, obtained by Mr. S. Jillson in Hudson, were exhibited. Mr. Jillson states that the previous year he found in the same locality a nest of unspotted crow's eggs, probably the eggs of the same pair.

Dr. T. M. Brewer remarked that such a peculiarity in the crow's eggs had never, so far as he was aware, been observed before. A few birds, *e. g.*, certain kinds of flycatchers, vireos

and hawks, have white unspotted eggs, or eggs sparsely spotted, sometimes exhibiting these variations in the same nest. Generally the earlier in the season the greater the number and the brightness of these markings.

A fish hawk that has been several times robbed, instead of laying the usual highly colored egg peculiar to the species, deposits one nearly white, and with very few light spots. But here, in two instances at least, early in the season, the eggs of the crow were unspotted, exhibiting only a light greenish ground—an occurrence hitherto unrecorded, and not easy of explanation.

November 3, 1869.

The President in the chair. Thirty-three persons present.

The following paper was presented: —

THE MOLLUSCAN FAUNA OF NEW HAVEN. PART II. ACEPHALA AND BRYOZOA. BY GEORGE H. PERKINS, PH.D.

LAMELLIBRANCHIATA.

PHOLADIDÆ.

CYRTOPLEURA Tryon, 1867.

Cyrtopleura truncata Tryon, Am. Journ. Conch., Vol. III, No. 3, p. 2, App. *Pholas truncata* Say, Am. Conch., p. 107, 1822; De Kay, Moll. N. Y., p. 248, pl. xxxiv, fig. 223; Sowerby, Thes. Conch., Vol. II, pl. civ, figs. 29, 30.

Not rare in peat bogs and clay near high water mark, associated with *Mya* and *Petricola*. Animal much larger than the shell, with the mantle closed; gills two pairs, very long, meeting at the base of the siphonal tube and extending some distance into it. Foot oval, obliquely truncated at the end, across which runs a ridge from which the surface is bevelled to the edges; palpi rather long, triangular;

siphons united into a tube, which is large, long, and capable of great extension, black at the end, the rest yellowish white.

MEASUREMENTS.

Length of shell		50 mill.			Breadth 20 mill.
"	siphon tube	57	"	(contracted).	
"	" "	170	"	(extended).	
"	foot	11	"		" 7 mill.
"	palpi	14	"		
"	gills	54	"		

MARTESIA Leach, 1847.

Martesia cuneiformis Tryon, Am. Journ. Conch., Vol. III, No. 3, p. 10, App. *Pholas cuneiformis* Say, Am. Conch., p. 108, 1822; De Kay, Moll. N. Y., p. 248. *Pholas rudis et P. Edwardsii* Gray, Syn. Brit. Mus. (teste Tryon).

I found one specimen of this species in a pile of shells on the beach. I have not heard of any others being found here. It is not uncommon on the coast of Florida. I have seen it from there in cavities which it had excavated in fragments of large shells.

TEREDIDÆ.

TEREDO Linn., 1758.

Teredo navalis Linn., Syst. Nat., 1267; Lam., An. sans Vert., Vol. VI, p. 38; Cuvier, ed. Audouin, Moll., pl. cxiv, fig. 2; Gould, Invert. Mass., p. 26; Chenu, Man. Conch., Vol. II, p. 10, fig. 59. *Teredo marina* Selluis, Hist. Nat. Tered., pl ii, fig. 2, 1733 (teste Tryon).

The only locality in which I have found this species is an old half-buried wreck near the entrance of the harbor. This is completely filled with living shells. Animal vermiform, bluish white; mantle closed except at the ends; gills very long and narrow, reddish brown, edges slightly serrate; foot oval; siphons very long, united except at the ends, attached to the tube near the point of division; at the ends small, slender, nearly equal, white or yellowish, spotted with rufous, or sometimes clear white; ventral siphon fringed at the end with a few large papillæ; dorsal tapering, not fringed; tube somewhat corrugated; ovaries large; ova white.

MEASUREMENTS.

Length of shell		3	mill.	Breadth 2.4 mill. Height 2 mill.
"	animal	58	"	
"	vent. siphon	3.6	"	from points of separation.
"	dorsal "	2	"	from points of separation.
"	pallets	2	"	

The Teredos, in the wreck just mentioned did not, as all authors that I have seen state, follow the grain of the wood alone in making their tubes, but quite as often crossed it; and in some parts there were more tubes running across the grain than with it, and, in general, no regard seemed to be paid to this point. One day, about the middle of May, as I was examining one of the animals under a lens, I noticed a series of pellets, barely visible to the naked eye, coming rapidly from the anal siphon. By the aid of a higher power I found them to be embryos, ova and young, in all stages of development. The ova were spherical, or nearly so. The mature embryos were round, much flattened transverely, a little flattened on one side, and on the opposite furnished with a crescent-shaped portion which bore a few rather long cilia, by which a brisk motion was effected. The embryos were provided with cilia when quite immature, and even in the ova there was a slow motion, though I could detect no cilia.

The immature embryos were of all shapes and sizes, and continually changed their form, though usually one end was larger than the other, and in all cases they were longer and narrower than when fully developed. It may not be the habit of the animal thus to eject eggs and embryos of all degrees of maturity. The specimen observed was somewhat injured, and on this account may have been excited to unnatural exertions. The animal seems to live about as well, for a time at least, without the shell and parts contained as with it. I have kept them living for many days after the body had broken off just behind the shell, which it does very easily.

Xylotrya palmulata Chenu, Man. Conch., Vol. II, p. 11, figs. 64, 65, 66; Woodward, Man. Moll., p. 507, pl. xxiii, fig. 28; Stimps., Check List. *Teredo palmulata et bipalmulata* Lamarck, An. sans Vert., Vol. VI, p. 38.

A few specimens of this shell were found with *Teredo navalis.*

SAXICAVIDÆ.

SAXICAVA Fleur de Bell., 1802.

Saxicava arctica Linn., Syst. Nat. *Saxicava pholadis* Lam., An. sans Vert., Vol. v, p. 501. *Saxicava distorta* Say, Am. Conch., p. 106, 1822; Gould, Invert. Mass., p. 61, fig. 40; De Kay, Moll. N. Y., p. 227, pl. xxxiii, fig. 309.

Not common. Lives in sand near low water. Animal white; mantle closed, except a small pedal opening; gills long and narrow, brown; foot when contracted flattened, conical, with a deep byssal groove, blunt at the end; byssus composed of horn-colored fibres; palpi broad at the base, straight posteriorly, curving irregularly to a point in front; siphons distinct only at the tips, which are thickly covered with papillæ.

MYIDÆ.

MYA Linné, 1747.

Mya arenaria Linn., Syst. Nat., 12th ed., p. 1112; Lam., An. sans Vert., Vol. VI, p. 74; Gould, Invert. Mass., p. 40; De Kay, Moll. N. Y., p. 240. *Mya mercenaria et acuta* Say, Am. Conch., p. 103, 1822.

Occurs wherever there is mud or sand between high and low water in great abundance, and in the spring the shore is covered for long distances with young shells about an inch long. Animal yellow, mantle closed; gills broad and thin, nearly equal, rounded before, pointed behind; foot when contracted sub-spatulate, obtusely pointed; palpi long and narrow, outside smooth, inside striated; siphons united except at the very end; tube long, near the end surrounded by a row of papillæ; around the ventral opening are two rows of unequal papillæ; the dorsal opening is also fringed with smaller ones; each has around the inside a black line.

MEASUREMENTS.

Length of shell	73 mill.	Breadth 47 mill.	Height 34 mill.
" gills	21 "	" 30 "	
" foot	11 "	" 10 "	
" palpi	22 "	" 5 "	

CORBULIDÆ.

CORBULA Brug., 1792.

Corbula contracta Say, Am. Conch., p. 103, 1822; Gould, Invert. Mass., p. 43, fig. 37; De Kay, Moll. N. Y., p. 241, pl. xxviii, fig. 285.

Not common. I have dug it up alive from sand at low water, near Savin Rock.

ANATINIDÆ.

LYONSIA Turton, 1822.

Lyonsia hyalina Conrad, Journ. Acad. Nat. Sci. Phil., Vol. VI, p. 261. *Osteodesma hyalina* Gould, Invert. Mass., p. 46, fig. 31; De Kay, Moll. N. Y., p. 234, pl. xxxiii, fig. 311.

Not common; very rarely found alive.

PANDORIDÆ.

CLIDIOPHORA Carpenter, 1864.

Clidiophora trilineata Carp., Proc. Zoöl. Soc. Lond., 1864. *Pandora trilineata* Say, Am. Conch., pp. 89, 151, pl. ii; Gould, Invert. Mass., p. 44; De Kay, Moll. N. Y., p. 239, pl. xxxiii, fig. 310.

Abundant in mud in a few feet of water, and often on the shore. Animal light brown; in April and May with ova; mantle closed; gills rather long, narrow, deeply striated; foot when contracted truncate before, curving to a point behind; when extended tongue-shaped and pointed; when directed straight downwards, or when directed forward, rhomboidal, white; palpi very small, triangular; siphons united except at the end, scarcely extended beyond the shell, white, thickly spotted with red and black, fringed with few and blunt papillæ, about fourteen around the dorsal and six around the ventral opening, those about the former not at the end, but forming a sort of collar below it.

MEASUREMENTS.

Length of	shell	20 mill.		Breadth	12 mill.	Height 3.4 mill.
"	foot	10 "	(extended).	"	9 "	
"	"	3.8 "	(contracted).	"	6.4 "	
"	siphons	2 "		"	5 " at shell.	
"	palpi	1.6 "		"	1 " at base.	

SOLENIDÆ.

ENSATELLA Swainson, 1840.

Ensatella ensis Linn., sp. *Ensis ensis* Conrad, Am. Journ. Conch., Vol. III, App. p. 26. *Solen ensis* Linn., Syst. Nat., 1114; Lam., An. sans Vert., Vol. VI, p. 55; Gould, Invert. Mass., p. 29; De Kay, Moll. N. Y., p. 242, pl. xxiii, fig. 313.

Dead shells not uncommon; rarely found alive. It is smaller, and lives in deeper water than north, not being found above low water. Animal white; mantle open in front and behind, with a small fissure near the middle, broadly thickened on the margin; gills long and narrow; foot larger than all the rest of the body, flattened-cylindrical, increasing somewhat in size towards the end, which is obliquely truncated, and the sides bevelled from a central line; palpi long and narrow, except at the base, which extends forward in a wing-like projection; siphons very short, united, except at the end, covered with short papillæ, and fringed around the openings with somewhat longer ones; muscle long and thin.

MEASUREMENTS.

Length of	shell	126	mill.		Breadth	21.4	mill.	
"	foot	83	"	(contracted).	"	13	"	at the end.
"	gills	47	"		"	7.4	"	
"	palpi	15.2	"		"	13	"	at base.

SOLECURTIDÆ.

SILIQUA Mühl., 1811.

Siliqua costata Conrad, Am. Journ. Conch., Vol. III, No. 3, p. 24, App. *Machæra costata* Gould, Invert. Mass., pp. 24, 34; De Kay, Moll. N. Y., p. 244, pl. xxxii, fig. 301. *Solen costatus* Say, Am. Conch, p. 104, 1822. *Solecurtus costatus* Say, Am. Conch., p. 168, pl. xviii, 1822.

Very rare and small.

TELLINIDÆ.

ANGULUS Mühl., 1811.

Angulus tenera Tryon, Am. Journ. Conch., Vol. III, No. 5, p. 96. *Tellina tenera* Say, Am. Conch., p. 98, 1822; Gould, Invert. Mass., p. 68, fig. 44; De Kay, Moll. N. Y., p. 209, pl. xxvi, fig. 271.

Not very common. Lives in a few feet of water, buried in sand. Animal white; mantle open, fringed with short papillæ; gills serrate on the edges; foot when contracted curved below, above curved to a sharp point anteriorly, and more abruptly curved behind, grooved below; palpi triangular, not long, striated coarsely inside; siphons distinct, long, slender.

Angulus polita? Tryon, Am. Journ. Conch., Vol. III, pt. V, p. 94, App. *Tellina polita* Say, Am. Conch., p. 97, 1822; De Kay, Moll. N. Y., p. 210.

A few specimens have been found which are somewhat doubtfully referred to this species.

Peronea Poli, 1791.

Peronea tenta Tryon, Am. Journ. Conch., Vol. III, pt. V, p. 98, App. *Tellina tenta* Say, Am. Conch., p. 228, pl. lxv, fig. 3, 1822; Gould, Invert. Mass., p. 68, fig. 43; De Kay, Moll. N. Y., p. 210.

Very rare.

Macoma Leach, 1819.

Macoma fusca Stimps., Check List. *Psamobia fusca* Say, Am. Conch., p. 126, 1826. *Sanguinolaria fusca* Gould, Invert. Mass., p. 66, fig. 42; De Kay, Moll. N. Y., p. 212, pl. xxxii, fig. 304.

Very large and abundant. It thrives best in water that is not very salt, and is much larger and more abundant near the mouths of fresh water streams than outside the harbor. It lives in sand or mud, just beneath the surface, below, or near low water. Animal white; mantle open in front, edge ruffled and bordered with dark brown; gills small, one on each side; foot tongue-shaped; when extended nearly as long as the shell; palpi triangular, large; siphons very long and slender, when extended nearly twice as long as the shell. The animal moves quite briskly by jerking itself along with its foot.

MEASUREMENTS.

Length of shell	17 mill.	Breadth 13.8 mill.	Height 6.6 mill.
" ventral siphon	25 "	" 3 "	} at base.
" dorsal "	17 "	" 2 "	} at base.
" foot	12 "	" 11 "	

Some of the specimens are 41 mill. long by 32 broad.

Cumingia Sowerby, 1833.

Cumingia tellinoides Conrad, Journ. Acad. Nat. Sc., Vol. VII, p. 234; Gould, Invert. Mass., p. 56, fig. 34; De Kay, Moll. N. Y., p. 233.

Very rare.

MACTRIDÆ.

Mulinea Gray, 1837.

Mulinea lateralis Conrad, Am. Journ. Conch., Vol. III, pt. III, p. 31, App. *Mactra lateralis* Say, Am. Conch., p. 101, 1822; Gould, Invert. Mass., p. 54, figs. 34, 35; De Kay, Moll. N. Y., p. 230, pl. xxix, fig. 287. *Mactra rostrata* Philippe, Abbild. III, 138, pl. iii, fig. 6, 1845. *Mactra corbuloides* Desh., Reeves's Conch., fig. 103 (teste Conrad).

Obtained abundantly by dredging, but usually not common on shore. In the fall of 1868, however, great numbers were thrown upon the beach, forming long ridges. Animal white; mantle open; foot tongue-shaped; when fully extended, as long as the shell; siphons united, fringed at the ends, where they are scarcely distinct, the ventral extending a little beyond the dorsal; palpi long, pointed, falcate.

MEASUREMENTS.

Length of shell	16.4	mill.	Breadth	12.8 mill.
" siphon	4	"	"	5 "
" foot	16	"	(extended).	

Hemimactra Swainson, 1840.

Hemimactra solidissima Conrad, Am. Journ. Conch., Vol. III, pt. III, p. 32, App. *Mactra solidissima* Gould, Invert. Mass., p. 51; De Kay, Moll. N. Y., p. 229, pl. xxix, fig. 286. *Mactra similis* Say, Am. Conch., p. 101, 1822; Gould, Invert. Mass., p. 52, note; De Kay, Moll. N. Y., p. 230.

Not very common, found only outside the harbor. Animal white; mantle open; gills large, thin, nearly equal; foot moderately large; when extended, as long as the shell, tongue-shaped; when contracted, rhomboidal, notched in the middle of the lower margin; palpi very long, narrow; siphons short, distinct only at the end; openings fringed.

MEASUREMENTS.

Length of shell	80 mill.		Breadth	55 mill.	
" foot	21	" (contracted).	"	24	"
" gills	45	"	"	20	"
" palpi	31	"	"	7	"
" siphons	10	"	"	11	"

After comparing specimens from several localities, I am convinced that the *similis* Say, is identical with this species, not its young, as some suppose, for the characters of Say's species are found in specimens of large size, but simply a variety due to difference of station. I have not yet seen specimens answering to both species from the same locality. Those from Chelsea Beach have the flatter, less triangular form ascribed to *solidissima*, those from here all have the triangular form of Say's *similis*, while those from Coney Island, N. Y., are so nearly intermediate as to make it impossible to refer them satisfactorily to either. The young of all are more trigonal than the old, but difference in station seems to make great differences in the shell. The British species most nearly allied to *solidissima*, *M. solida*, according to Clark, "varies in shape in every locality,"[1] and the same seems to be true, in some degree at least, in respect to our own. The slight differences mentioned as distinguishing the two species aside from the form, are found in nearly all that I have seen, and do not coincide with any particular form.

VENERIDÆ.

Cytherea Lamarck, 1805.

Cytherea Sayii Conrad. *Cytherea convexa* Gould, Invert. Mass., p. 34, fig. 49; De Kay, Moll. N. Y., p. 216, pl. xxvii, fig. 279. *Callista convexa* Say, Journ. Acad. Nat. Sc. Phil., Vol. iv, p. 149, pl. xii, fig. 3, 1824.

Very rare. Mr. Say's specific name "*convexa*" being, as Mr. Conrad says, preoccupied, he proposes the above specific name, "*Sayii.*"

Crassivenus nov. gen.

Crassivenus mercenaria nobis. *Mercenaria violacea* Stimps., Check List. *Venus mercenaria* Linn., Syst. Nat., 1131; Lam., An.

[1] Brit. Mar. Test. Moll., p. 105, London, 1855.

sans Vert., Vol. VI, p. 346; Gould, Invert. Mass., p. 85, fig. 67; De Kay, Moll. N. Y., p. 217, pl. xxvii, fig. 276.

Common round clam. Occurs abundantly in sand just below tide level. Animal with mantle open freely, except behind, where it is united to form two very short siphons, which are blackish, fringed at the ends, bright yellow inside; the mantle is thickened and ruffled at the edge, yellowish white; gills, two pairs, greenish white, oblong-ovate, somewhat pointed behind, hanging obliquely, inner a little larger; foot rather large, when contracted broad and short, strongly striated, somewhat crenulate on the lower edge, which is sharp, broadest before and obtusely rounded behind, pointed bluntly, color buff yellow; palpi lanceolate, smooth without, striated within; muscles pink on the inner side, white on the outer, anterior pear-shaped, posterior ovate.

MEASUREMENTS.

Length of shell	77	mill.	Breadth	71 mill.	Height 54 mill.
" foot	37	"	"	15 " anteriorly.	
" gills 28 and	29	"	"	15 and 16.4 mill.	
" palpi	12.6	"	"	7 mill.	
" siphon tube	14	"	"	8 "	

As, according to the British Association rules, no specific name can be made generic, those formerly given to this and the next species do not hold. I therefore propose the names here given.

TOTTENIA~~NA~~ nov. gen.

Tottenia~~na~~ gemma nobis. *Gemma Totteni* Stimps., Check List. *Venus gemma* Totten, Am. Journ. Sc., Vol. XXVI, p. 366; Gould, Invert. Mass., p. 88, fig. 51; De Kay, Moll. N. Y., p. 218, pl. xxvii, fig. 271.

Abundant in places, but not generally common. This species is viviparous. In living specimens collected in the latter part of January, 1869, I found small, well formed young. There were in some thirty six, but the average number was thirty three. These young shells were oval, flat, transparent, longer than broad, the reverse of what is usual in the adult, and in the same adult shell of nearly equal size. In one shell, which contained thirty six, the young measured three fifths mill. long and two fifths mill. broad, the adult shell being three mill. long and three and two fifths mill. broad. I have changed the name of this shell for the reason mentioned under the preceding species.

PETRICOLIDÆ.

Petricola Lam.

Petricola pholadiformis Lam., An. sans Vert., Vol. vi, p. 159; Say, Am. Conch., p. 222, pl. lx, fig. 1, 1834; Gould, Invert. Mass., p. 63; De Kay, Moll. N. Y., p. 228, pl. cxxviii, fig. 282. *Petricola fornicata* Say, Am. Conch., p. 106.

Abundant in clay, peat bogs, old timber, etc., near high water. Animal white; mantle closed in front, thickened along the closed edge; gills long, rather narrow, yellow; foot when expanded broad and short, triangular, pointed in front and slanting to a point behind, grooved; palpi triangular, siphons united for about a fifth of their extended length, after that distinct, diverging, tapering,—ventral longest; openings fringed, the ventral siphon having six long incurved papillæ, which are fringed on the upper surface by a row of small papillæ on each side, which are again in like manner fringed, alternating with, and a little outside of, these are six somewhat smaller, and outside of these another row of much smaller papillæ; these two latter rows are slightly fringed; the dorsal siphon has inside a few large, simple papillæ, and outside of these numerous smaller ones. The animal is quite active in its movements.

MEASUREMENTS.

Length of shell	43.6 mill.	Breadth	15.6 mill.,	convex 14.4 mill.			
" vent. siphon	62 "	"	4.6 "	at base,	3.2 at tip.		
" dor. "	45 "	"	5 "	"	2.4 "		
" foot	10.6 " (extended).	"	14 "				
" gills	23 "	"	9 "				
" palpi	9.4	"	4 "				

Petricola dactylus Sby., 1834; Say, Am. Conch., p. 222, pl. lx; Gould, Invert. Mass., p. 65, fig. 41; De Kay, Moll. N. Y., p. 228, pl. xxviii, fig. 283.

Not as common as the preceding, and seems to live in deeper water, as I have not found it living with it, but only dead shells on the beach. It is often larger and stouter than *P. pholadiformis*, and is, I believe, only a variety of it.

CARDIADÆ.

Lævicardium[1] Swainson, 1840.

Lævicardium Mortoni. *Liocardium Mortoni* Stimps., Check List. *Cardium Mortoni* Conrad, Journ. Acad. Nat. Sc. Phil., Vol. VI, p. 259, pl. x, figs. 5, 6, 7; Gould, Invert. Mass., p. 91; De Kay, Moll. N. Y., p. 207, pl. xxiii, fig. 251.

Quite common at certain seasons, but usually rather rare. It varies greatly in color, and is usually roughened, as if weathered, on the outside. Animal white; mantle open, edge somewhat ruffled; gills two pair, inner much larger than outer; foot large and long, when contracted it is folded back upon itself; palpi not long, narrow; siphon tube merely a circular opening in the mantle surrounded by numerous short papillæ.

Cardium Linné, 1758.

Cardium pinnulatum Conrad; Gould, Invert. Mass., p. 90, fig. 57; De Kay, Moll. N. Y., p. 205, pl. xxii, fig. 249.

Very rare, collected near the entrance of the harbor by Professor Verrill.

ASTARTIDÆ.

Astarte Sowerby, 1816.

Astarte lutea[2] nobis.

Shell gibbous, thick, inequilateral, subtrigonal, length and breadth nearly equal, surface curving regularly from the umbones to the opposite edge, highest just above the middle; beaks prominent, much incurved, not meeting; lunule deep, heart-shaped; surface undulated by twenty or more large, elevated ridges, which are concentric, nearly equidistant, the sulcations between nearly as broad as the ridges, which are highest and sharpest on the upper half of the shell, becoming finer, but not disappearing at the ends, in the lunule being merely coarse striæ; anterior slope incurved; posterior slope slightly curved; margin distinctly crenulated within; teeth stout, summits somewhat rounded; in the right valve one cardinal tooth with a deep

[1] Often, but incorrectly, written *Liocardium*. The name is from *lævis* and *cardium*.

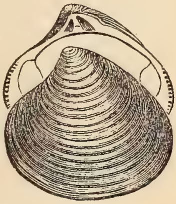
[2] *Luteus*, orange colored.

pit on either side of it, and a small rudimentary lateral tooth on each side of the shell; left valve with two scarcely diverging cardinal teeth separated by a deep pit; hinge margin thin, not very broad; pallial impression deep, simple; muscular impression rather deep; epidermis chestnut brown, interior pearly white. Length twenty three mill. (.9 in.), breadth twenty one mill. (.82 in.), height twelve mill. (.48 in.).

Animal with mantle open, light yellow, edged with a cord of bright orange, edge plain; gills not large, two on each side, very unequal, inner much largest, somewhat rhomboidal; outer subtriangular united to the inner behind and so appearing like a reflexed portion of it; white, finely striated; foot thin, tongue-shaped, when fully extended nearly as long as the shell, when contracted wedge-shaped; color bright orange striped longitudinally with light yellow; palpi not long, broadly lanceolate; siphons none, merely an opening in the mantle serving instead; ovaries full of bright orange ova in April.

MEASUREMENTS.

Length of foot	9	mill. (contracted).	Breadth 4	mill.
" outer gills	6.6	"	" 8.8	"
" inner "	9	"	" 6	"
" palpi "	4	"	" 2.2	" at base.



This shell in some respects approaches the *semisulcata* Leach, and still more closely *castanea* Say, but affords good differences. From the former it differs in form, being broader and not as long, in its greater thickness, smaller and more numerous ridges continued to the edge, broader lunule, and more prominent and curved beaks. It differs from the latter in its much narrower hinge margin, smaller and less prominent teeth, less elevated beaks, less oblique and narrower outline, and strong ridges. To show its differences in form I give comparative measurements.

	A. castanea Say.	*A. semisulcata* Leach.	*A. lutea* nobis.
Length	23 mill. .9 in.	23 mill. .9 in.	23 mill. .9 in.
Breadth	24.4 " .95 in.	19.4 " .77 in.	21 " .82 in.
Height	13.4 " .53 in.	8.4 " .34 in.	12 " .48 in.

KELLIADÆ.

KELLIA Turton, 1822.

Kellia planulata Stimpson, Shells of N. E., p. 17. *Kellia rubra* Gould, Invert. Mass., p. 60, fig. 23; De Kay, Moll. N. Y., p. 232.

Not common, occurs in accumulations of small shells on the shore.

SOLENOMYADÆ.

SOLENOMYA[1] Lamarck, 1818.

Solenomya velum. *Solemya velum* Say, Am. Conch., p. 105, 1822; Gould, Invert. Mass., p. 35; De Kay, Moll. N. Y., p. 245, pl. xxx, fig. 292.

Common on the beach, though rarely living. It lives in sand at and below low water mark. Animal white; mantle closed except at the ends, widely open anteriorly for the foot, and posteriorly forming a very short tube surrounded by globular papillæ; size of this opening varies considerably at different times, and occasionally it is contracted across the middle, making two apertures, which has probably caused some writers to state that there existed two openings; gills behind the foot, one on each side thick, narrow, the incurved ventral edges meeting so as to form a cylindrical dark brown mass, which is in strong contrast with the other parts, which are white; foot long, obliquely truncated at the end, which is broadly and deeply cleft, fringed around the edge; around the posterior part of the pedal opening the mantle has about fourteen short, round papillæ, some of which are colored and may serve as ocelli; epidermal fringe attached to the mantle, and when the shell is closely shut folded inward.

CYRENIDÆ.

SPHÆRIUM Scap., 1777.

Sphærium sulcatum Prime, Am. Corbic., p. 33, fig. 25. *Cyclas similis* Say, Am. Conch., p. 54, 1816; Gould, Invert. Mass., p. 72, fig. 53; De Kay, Moll. N. Y., p. 222, pl. xxv, fig. 264.

Very abundant in streams.

[1] Often, but incorrectly, written Solemya. It comes from *Solen* and *Mya*.

Sphærium partumeium Prime, Am. Corbic., p. 45, fig. 42. *Cyclas partumeia* Say, Am. Conch., p. 112, 1822; Gould, Invert. Mass., p. 73, fig. 54; De Kay, Moll. N. Y., p. 223, pl. xxv, fig. 262.

Rare and small.

Sphærium solidulum Prime, Am. Corbic., p. 36, fig. 27. *Cyclas solidula* Prime, Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 158, 1851.

Animal white; mantle open, edged with an orange cord; gills rather narrow; foot long, tongue-shaped; palpi long and narrow, rounded at the tips; siphons distinct, simple at the ends, not long, broad, ventral nearly twice as large as the dorsal, orange or reddish yellow, or rarely white; shell filled with young in May, usually containing ten of various sizes; some are contained in the gills and some in the mantle, the largest being four mill. long, three broad and two high.

Sphærium securis Prime, Am. Corbic., p. 49, fig. 47. *Cyclas securis et cardissa* Prime, Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 160, 1851.

Not uncommon in some ponds. The foot is very long and narrow, and the animal, like the Pisidiums, crawls very rapidly by extending it fully and, holding by the end, drawing the shell near to it. In this way they crawl up the sides of a glass vase with ease, though a slight jar causes them to fall.

PISIDIUM Pfeiffer, 1821.

Pisidium æquilaterale Prime, Am. Corbic., p. 63, figs. 65, 66; do. Bost. Journ. Nat. Hist., Vol. VI, p. 366, pl. xii, figs. 23–25.

Lives in ponds but is not common. Animal flesh color; foot very long, strap-shaped, rounded at the tip; siphons very short, tapering, simple at the ends.

Pisidium abditum Haldeman, Proc. Acad. Nat. Sc. Phil., Vol. I, p. 53, 1841; Prime, Am. Corbic., p. 68, fig. 72; De Kay, Moll. N. Y., p. 226. *Pisidium obscurum* Prime, Bost. Journ. Nat. Hist., Vol. IV, p. 161. *Pisidium minus* Stimpson, Shells of N. E., p. 16.

Not common. Lives in quiet ponds.

Pisidium compressum Prime, Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 164; do. Am. Corbic., p. 65, fig. 68.

Not common. Lives in ponds and ditches.

Pisidium variabile Prime, Proc. Bost. Soc. Nat. Hist., Vol. IV, p. 163; do. Am. Corbic., p. 66, fig. 69.

Not very rare.

Pisidium virginicum (Bourg.) Prime, Am. Corbic., p. 61, figs. 61, 62. *Cyclas dubia* Say, Am. Conch., p. 55, 1816; Gould, Invert. Mass., p. 75, fig. 56. *Pisidium abruptum* Haldeman, Proc. Acad. Nat. Sc. Phil., Vol. I, p. 53.

Very rare.

UNIONIDÆ.

Naia Swainson, 1840.

Naia complanatus. *Unio complanatus* Lea, Proc. Acad. Nat. Sc. Phil.; Gould, Invert. Mass., p. 107, figs. 68–70; De Kay, Moll. N. Y., p. 188, pl. xxii, fig. 246. *Unio purpureus* Say, Am. Conch., pp. 50, 135, pl. lxxi, fig. 7, 1816.

Very common, but usually small and very badly eroded. Animal variable in color, yellow or white; mantle open, thin, white, mottled thickly with yellow flakes, edge plain; gills large and thick, hanging horizontally, straight before, rounded behind, transversely striated with numerous lines, which are connected by fine cross lines, giving to the gill a beautifully tessellated appearance; lower edge darker; inner gill a little larger; foot when extended tongue-shape, half to two thirds as long as the shell; palpi short, broad, rounded at the ends, striated within; siphons very short, barely projecting beyond the shell, broad and flat, fringed with short papillæ; ends black, or nearly so, papillæ lighter.

MEASUREMENTS.

Length of	shell	106	mill.		Breadth 61 mill.	Height 32 mill.
"	foot	48	"	(contracted).	" 13 "	
"	gills	58	"		" 23 "	
"	palpi	11	"		" 5 "	
"	ventral siphon	30	"		" 24 "	
"	dorsal "	20.6	"		" 15 "	

Eurynia, Rafinesque.

Eurynia nasuta Stimps., Shells of N. E., p. 13 (Agassiz mss.); Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 54. *Unio nasutus* Say, Am. Conch., p. 52, pl. lxxii, fig. 1, 1816; Gould, Invert. Mass., p. 109, fig. 71; De Kay, Moll. N. Y., p. 191, pl. xx, fig. 239.

Collected in West River and Whitneyville Pond by Professor Verrill. Not common.

Lampsilis Rafinesque, 1820.

Lampsilis radiata Stimpson, Shells of N. E., p. 13 (Agassiz MSS.); Morse, Journ. Port. Soc. Nat. Hist., Vol. I, p. 47. *Unio radiatus* Lam., An. sans Vert., Vol. VI, p. 535; Gould, Invert. Mass., p. 110, fig. 73; De Kay, Moll. N. Y., p. 189.

Common in Saltonstall Lake and Whitneyville Pond.

Margaritana Schum., 1817.

Sub genus Strophitus Raf.

Margaritana undulata Lea, Trans. Am. Phil. Soc. *Alasmadonta undulata* Say, Am. Conch., p. 62, 1819; Gould, Invert. Mass., p. 115, fig. 76; De Kay, Moll. N. Y., p. 198, pl. xv, fig. 227.

Not common. Occurs in Whitneyville Pond.

Anodonta Cuvier, 1798.

Anodonta cataracta Say, Am. Conch., p. 53, pl. lxxi, fig. 4, 1816. *Anodonta fluviatilis* Lea, Trans. Am. Phil. Soc., Vol. VI, p. 38; Gould, Invert. Mass., p. 117, fig. 80; De Kay, Moll. N. Y., p. 203, pl. xl, fig. 358.

Quite common in rivers and ponds, being much larger in the latter.

MYTILIDÆ.

Mytilus Linné, 1758.

Mytilus edulis (Linn.) Lam., An. sans Vert., Vol. VII, p. 47; Gould, Invert. Mass., p. 121, fig. 82. *Mytilus borealis* (Lam.) De Kay, Moll. N. Y., p. 182, pl. xiii, fig. 222. *Mytilus notatus* De Kay, Moll. N. Y., p. 182, pl. xiii, fig. 223 (young). *Mytilus pellucidus* De Kay, Moll. N. Y., p. 183, pl. xxiv, fig. 256.

Common in all pools near low water mark, and often very finely marked with blue, green or black. The animal varies in color from white to deep orange; mantle freely open, edge thickened, bordered by a dark line, double, outer part simple, inner from the siphonal openings to about the middle of the ventral side fringed with short, dark, branched papillæ; gills large, long, equal; foot always dark brown, short, thick, obtusely pointed, grooved; palpi triangular, round pointed at the ends, beveled from a median elevated line to the edges, striate within.

MEASUREMENTS.

Length of shell 52 mill.		Breadth 29 mill.		Height 21 mill.
" foot 10 "	(contracted).	" 5.4 "		
" palpi 12 "		" 6 "		
" gills 38 "		" 11 "		

Modiola Lam., 1798.

Sub genus Brachydontes Swainson, 1840.

Brachydontes plicatula Chenu, Man. Conch., Vol. II, p. 155. *Modiola plicatula* Lam., An. sans Vert., Vol. VII, p. 22; Gould, Invert. Mass., p. 125, fig. 81; De Kay, Moll. N. Y., p. 184, pl. xxiv, fig. 258.

Very abundant everywhere in mud, peat bogs, or on rocks above low water mark. Animal varies in color from white to salmon; mantle freely open, white edged with brown, somewhat ruffled; gills nearly equal; foot short, brown, obtusely pointed, with a byssal groove; palpi long, thin, finely striated, beveled on the inner side from a central ridge.

Brachydontes hamatus nobis. *Mytilus hamatus* Say, Am. Conch. pp. 91, 204, pl. 1, 1822; De Kay, Moll. N. Y., p. 183.

Shell very much incurved and contracted at the beaks, which are acute, and directed a little outward; surface covered with numerous fine ribs about the same width as the spaces between, more numerous anteriorly; lines of growth distinct, especially on the ribs, making them slightly cancellated; byssus short and thick, shell depressed about the byssal opening; color dark brown or nearly black, lightest on the ribs and towards the ventral margin; inside dark purple, shading to white on the edge. Animal with mantle open, edge double, whitish, mottled with numerous reddish brown spots, and blackish on the edge, gills light yellow, the right a little longest, obtusely pointed; foot orange, cylindrical, pointed, grooved; palpi slender, beveled on the inner surfaces from a median ridge, striated. This shell, described by Mr. Say from the Gulf of Mexico, occurs in abundance on southern oysters, which are planted here; whether it is naturalized is doubtful. An examination of the animal has led me to consider it a *Modiola* rather than a *Mytilus*. It varies greatly in form from being more than twice as long as broad, to about the same length and breadth. The largest specimen I have seen is sixty six mill. (2.6 in.) long and thirty seven mill. (.45 in.) broad.

MEASUREMENTS.

Length of shell	48	mill.	Breadth	32	mill.	Height 19 mill.
" foot	10.6	"	"	3	"	
" gills	32	"	"	12	"	
" palpi	11	"	"	4.6		

Most of the specimens are more sharply incurved than Mr. Say's figure. In many the male of a species of *Pinnotheres* was living.

Modiola modiolus Linn., Syst. Nat., 1158; Turton, Brit. Biv.; Gould, Invert. Mass., p. 123; De Kay, Moll. N. Y., p. 185, pl. xxiv, fig. 257. *Modiola americana* Leach. *Modiola papuana* Lam., An. sans Vert., Vol. vii, p. 17; Say, Am. Conch., p. 199, pl. xlv, 1832. *Mytilus barbatus* Linn. *et Al.*

Not common, and rather small, but finely colored and heavily fringed with epidermal filaments.

ARCADÆ.

Argina Gray, 1840.

Argina pexata Gray. *Arca pexata* Say, Am. Conch., p. 93, 1822; Gould, Invert. Mass., p. 95, fig. 60; De Kay, Moll. N. Y., p. 176, pl. xii, fig. 211.

Very common just below low water mark, and often found alive on the shore at low tide. Animal with mantle freely open, edge ruffled, dark brown, with interrupted dark lines next the shell, and a row of ocelli; gills triangular, large, pointed behind, deep red, emitting a reddish fluid when the shell is opened; foot pointed behind; before with a straight, sharp edge; deeply grooved beneath, yellow, not very extensile; palpi none.

Scapharca Gray, 1847.

Scapharca transversa Say, Am. Conch., p. 93, 1822; Gould, Invert. Mass., p. 96; De Kay, Moll. N. Y., p. 177, pl. xii, fig. 212.

Not uncommon, though more rare than the preceding. Animal with mantle open, edge plain, with a row of ocelli; gills dark red or nearly black, attached to broad, white, sickle-shaped supports, curving about the posterior muscle, and, as in the preceding species, ejecting a reddish liquid when the shell is opened; foot bright yellow, heeled, rounded behind, obtusely pointed before, quite large, deeply grooved; when extended triangular, and as long as the shell; palpi

none, but a long narrow fold of the branchial membrane on each side of the mouth takes their place.

NUCULIDÆ.

Nucula Lamarck, 1799.

Nucula proxima Say, Am. Conch., p. 94, 1822; Gould, Invert. Mass., p. 103, fig. 63; De Kay, Moll. N. Y., p. 79, pl. xii, fig. 215.

Not common on the beach, but obtained plentifully by dredging. Animal white; mantle freely open, margin double, ruffled, striated; gills small, elongate-triangular, outer a little the longer, broad anteriorly, tapering to a point behind; foot flattened, cylindrical, ending in an oval disk, which is thin, serrate on the edges, with numerous short, thick papillæ, striated on both sides, and when withdrawn, folded together through the middle; palpi two pairs, outer with a thin parchment-like end, below which is a narrow striated lamina folded upon itself longitudinally; inner pair linear, long, united about the mouth; siphons wanting.

Nucula radiata De Kay, Moll. N. Y., p. 179, pl. xii, fig. 216.

Shells answering to this description are found here, but I believe that the species is founded merely upon the young of *N. proxima*, and ought therefore to be united with it, but as I have not absolute proof that this is so, I leave it separate.

LEDIDÆ.

Yoldia Müll., 1832.

Yoldia limatula Woodward, Man. Conch., p. 429, fig. 220. *Nucula limatula* Say, Am. Conch., p. 63, pl. xii, 1831; Gould, Invert. Mass., p. 98, fig. 62; De Kay, Moll. N. Y., p. 183, pl. xiii, fig. 218. *Leda limatula* Stimpson, Shells of N. E., p. 10.

Not common, scarcely ever found on the beach, but obtained abundantly by dredging a few miles off the lighthouse in four to six fathoms. Mantle open, edge somewhat thickened, plain anteriorly for about a third of its length, the remaining two thirds are fringed with about fifty moderately long, simple papillæ, some of which are forked at the end; gills small, narrow, coarsely striated; foot long, subcylindrical, increasing in size towards the end, which is obliquely truncated, deeply cleft and furnished with short, rounded papillæ;

anteriorly it is heeled, and when drawn into the shell is folded upon itself; palpi large, thick, triangular; siphons united, not long, ends not fringed, and withdrawn at times entirely within the edge of the mantle.

PECTINIDÆ.

Pecten Brug., 1789.

Pecten irradians Lam., An. sans Vert., Vol. VII, p. 143. *Pecten concentricus* Say, Am. Conch., p. 88, 1822; Gould, Invert. Mass., p. 134, fig. 88; De Kay, Moll. N. Y., p. 172, pl. xi, fig. 205.

Usually not common, and very small, but sometimes it is thrown upon the shore in great numbers. Animal very active, jumping and swimming by a rapid opening and closing of the valves; mantle open, edge much thickened, with an outer fringe of several rows of papillæ, the inner being largest, and among them about thirty bluish ocelli, of various sizes and at unequal intervals; inside of these, from a tenth to a quarter of an inch, according to the size of the animal, is a raised yellow cord, darker than the mantle, which bears a row of papillæ; the space between the inner and outer rows is thickly striated; gills semicircular, curving about the large muscle, rather broad and thick; foot very small, subcylindrical, tapering to an obtuse point, very deeply grooved; palpi broadly triangular, smooth outside, obliquely striated within.

OSTREIDÆ.

Ostrea Linn., 1758.

Ostrea virginica Lam., An. sans Vert., Vol. VII, p. 225; De Kay, Moll. N. Y., p. 169. *Ostrea virginiana* Gould, Invert. Mass., p. 136.

The southern oyster is brought here in great quantities and planted in the spring, to be taken up in the fall, as it cannot endure the cold of winter. By many writers it is regarded as the same as *Ostrea canadensis* Lam.

Ostrea borealis Lam., An. sans Vert., Vol. VII, p. 220; Gould, Invert. Mass., p. 137; De Kay, Moll. N. Y., p. 169, pl. x, fig. 204.

Native or northern oyster. It is quite abundant, in some places forming large beds. It is very variable in shape, accommodating itself to any unevenness of the surface on which it grows. I found,

in deserted Teredo tubes, quite a number that were tubular in form, some being forty nine mill. long, seven mill. high and five and two fifths mill. broad. Others, growing where tubes crossed, had grown out on each side, forming a quite regular T. The upper valve was flat in all cases. Animal whitish; mantle open, edge double, much thickened, fringed with numerous papillæ; gills long, rather narrow, curved so that the ends are nearly at right angles, nearly equal, edged with a white cord; foot none; palpi not long, broad at the base, anterior edge curved, posterior nearly straight, striated within.

MEASUREMENTS.

Length of shell		90	mill.	Breadth	57	mill.
"	animal	72	"	"	41	"
"	gills	62.2	"	"	8	"
"	palpi	8	"	"	15	"

ANOMIADÆ.

Anomia Linné, 1767.

Anomia ephippium Linn., Syst. Nat., 1150; Lam., An. sans Vert., Vol. VII, p. 273; Gould, Invert. Mass., p. 138; De Kay, Moll. N. Y., pl. xii, fig. 209.

Very common on rocks, old shells, etc., near low water mark.

TUNICATA.

ASCIDIADÆ.

Ascidia Linné, 1758.

Ascidia manhattensis De Kay, Moll. N. Y., p. 259.

Common near low water on eel-grass, stones, chips, etc., and at times thrown upon the shore in large numbers.

Molgula.

Molgula arenata Stimps.

Not common usually. It was, however, at one time dredged in abundance east of the Lighthouse, by Prof. F. A. Bradley.

Didemnium sp?

One cluster of an Ascidian of this genus has been found by Prof. Verrill.

POLYZOA.

Marine.

ESCHARINA.

Escharina lineata Leidy, Proc. Acad. Nat. Sc. Phil.
Not uncommon on old shells and stones.
Escharina variabilis Leidy, Proc. Acad. Nat. Sc. Phil.
Common on everything.

MEMBRANIPORA.

Membranipora tenuis Desor.
Common on fucus.

CELLULARIA.

Cellularia turrita Desor.
Quite common, thrown on the beach by storms.

LEPRALIA.

One species; undetermined.

Fresh Water.

FREDERICELLA.

Fredericella regina Leidy; Hyatt, Obs. on Polyzoa, Am. Nat., Vol. I, p. 64, pl. iii.

PECTINATELLA.

Pectinatella magnifica Leidy; Hyatt, Obs. on Polyzoa, Am. Nat., Vol. I, p. 136, pl. iv.
Plumatella sp?
These are not uncommon in ponds.
[The *Polyzoa*, both fresh water and marine, have not been studied carefully, and there is little doubt that many more species exist here.]

In conclusion, I give a list of the species reported from Long Island Sound, but not yet found in New Haven Bay.

CEPHALOPODA.

Loligo illecebrosa Les. Mentioned as common in various places.

GASTEROPODA.

Fasciolaria ligata Mighl. Stonington, Ct., Linsley.
Bela harpularia Couth. Stratford, Ct., Linsley.
Fusus imbricatus De Kay. " "
Fusus Trumbulli Linsley. Stonington, Ct., Linsley.
Buccinum undulatum. " "
Buccinum zonalis Linsley. " "
Nassa vibex Say. New Haven, Ct., "
Purpura lapillus. Stonington, Ct., Linsley.
Columbella rosacea Gould. Stonington, Linsley.
Pleurotoma bicarinata Couth. " "
Mamma? immaculata. Stonington, Linsley, and Gardiner's Bay, Long Island, N. Y., S. Smith.
Natica clausa Sowb. Stonington, Linsley.
Natica pusilla Say. " " Gardiner's Bay, L. I., S. Smith.
Eulima subangulata Stimps. Gardiner's Bay, L. I., S. Smith.
Cæcum pulchellum Stimps. " " "
Cæcum Cooperi Smith. " " "
Vermetus radicula Stimps. " " "
Vermetus lumbricalis Lam. New Haven and Stonington, Linsley.
Scalaria clathrus Linn. Stonington, Linsley.
Littorina littorea Linn. " "
Littorina peconica Smith. Gardiner's Bay, L. I., S. Smith.
Lacuna neritoidea Gould. Oyster River, Ct., Linsley.
Margarita obscura Couth. Stonington, Ct., "
Crucibulum striatum Say. Gardiner's Bay, S. Smith.
Tectura alveus Couth. Stratford, Ct., Linsley.
Chiton marmoreus O. Fabr. Stonington, Linsley.
Chiton apiculatus Say, Gardiner's Bay, N. Y., S. Smith.
Chiton ruber Lowe, Stonington, Ct., Linsley.

NUDIBRANCHIATA.

Œolis vermiferus Smith, Gardiner's Bay, N. Y.

LAMELLIBRANCHIATA.

Teredo dilitata Stimps. Gardiner's Bay, N. Y., S. Smith.
Pholas crispata Linn. Stonington, Ct., Linsley.

Thracia Conradi Couth. Gardiner's Bay, Smith.
Thracia truncata Migh. Stonington, Ct., Linsley.
Solenomya borealis Totten. " "
Siliquaria gibba Spengl. Stratford, Ct., Linsley.
Siliquaria bidens Chem. Gardiner's Bay, N. Y., Smith.
Siliquaria fragilis Couth. Stonington, Linsley.
Macoma sabulosa Sprengl. Stonington and Stratford, Ct., Linsley.
Solen viridis Say. Stonington, Linsley.
Tellina versicolor, Cozz. Stratford, Ct., Linsley.
Tellina solidula Soland. Stonington, Linsley.
Ceronia arctata Conr. " "
Abra æqualis Say. " "
Cytherea morrhuana Linsl. " "
Crassivenus / *Mercenaria* } notata Say. " "
Cardita borealis Conr. Stonington, Ct., Linsley and Gardiner's Bay, L. I., S. Smith.
Astarte castanea Say, Stonington, Linsley.
Astarte semisulcata Leach. " "
Astarte quadrans, Gould. " "
Astarte mactracea Linsley, Stratford, Ct., Linsley and Gardiner's Bay, Smith.
Cyprina islandica Linn. Stonington, Linsley.
Montacuta elevata Stimps. Gardiner's Bay, L. I., S. Smith.
Montacuta bidentata Gould. Stonington, Linsley.
Lucina filosa Stimps. " "
Thyasira Gouldiana Stimps. " "
Serripes Grœnlandicus. " "
Modiolaria lævigata Gray. Gardiner's Bay, L. I., S. Smith.
Modiolaria discors Linn. Oyster River, Ct., Linsley and Gardiner's Bay, L. I., S. Smith.
Yoldia sapotilla Gould, Gardiner's Bay, L. I., S. Smith.
Nucula tenuis Mont. Stonington, Linsley.
Pecten fuscus Gould. " "
Anomia aculeata Gmel. Stratford, Linsley.

NOTE. Many of Linsley's species came from fish-stomachs. His *Nautilus connecticutensis* is a Rhizopod. The list is taken from Linsley's, in Vol. XLVIII of the Am. Journal of Science, and from Sanderson Smith's list of the Mollusca of Long Island, in the Annals of the Lyceum of Natural History of New York, 1859. Some of the older names have been changed to those now in use.

Mr. W. H. Dall made a few remarks upon the distribution of marine animals, asserting that their range was influenced more by the temperature of the water than by the depth or other conditions.

He showed that the floating ice line of Bering Sea (which passes between the Pribyloff and St. Matthew groups of islands, touching the continent near Kuskoquim Bay), governed the distribution of the fish and mollusks of those waters. It is the northern limit of all the more southern forms, some of which range as far south as Monterey. It is the southern limit of almost all the truly arctic species. The fur seal is never found to the north of it, though often erroneously spoken of as coming from Bering Strait; the polar bear never passes to the south of this line; the cod invariably keep to the south, and the mullet to the north of it. It is also the limit of distribution of many fuci and seaside plants.

Where the water is cooled by northern currents, or by glaciers, deep water species of mollusks, especially brachiopods, are found at, or even above low water mark. Where the surface water is warm, these mollusks, which in the north are found near the shore, are only obtained at a depth of many fathoms.

The President gave notice that the first series of lectures for the season, entitled Sketches of Animal Life, would be given by Mr. Edward S. Morse upon successive Monday evenings, commencing November 8th.

Section of Microscopy. November 10, 1869.

Mr. R. C. Greenleaf in the chair. Sixteen persons present.

Dr. H. Hagen called the attention of the Section to the statements of Professor Listing of Göttingen, who had recently[1] given some suggestions concerning the further improvement of the microscope.

[1] Nachr. d. kgl. Gesell. der Wissensch., 1869, No. 1, and Poggendorff's Annalen, 1869, T. XVI, p. 467.

In all microscopes the dioptric arrangement is now analogous to the astronomic spy-glass; they have but one real image, from which the virtual image is formed and brought to the eye of the observer.

Professor Listing proposes to have two real images, and in this way to form three successive augmentations instead of two, as before. It is well known that by a prolongation of the draw tube, or by increasing the distance between the objective and the eye-piece, the image becomes successively greater, but the definition and penetration is by no means better. Professor Listing has made some experiments, and states that with an eye-piece of his construction (a double eye-piece with four lenses, similar to those of the terrrestrial spy-glasses) the magnifying power of the instrument, and also to nearly the same degree the penetration, is raised, by a tube of four hundred and twenty mill., 20, 28, 55, 97 and 137 per cent. (the latter, of course, with diminution of the field), more than the same objective (Hartnack's, No. 7) and eye-piece (No. 3) with a tube two hundred mill. in length. The object was *Pleurosigma angulatum*, and Professor Listing assures us that the latent power of the objective is developed by this means in an astonishing manner. He also remarked that the so called Erectors have long been used, but always with a low power and a short tube. The most advantageous form for the eye-piece would be, for the two superior glasses, achromatic lenses from fifteen to twenty mill. in diameter, and with a diaphragm between, having an aperture of from eight to nine mill. For the two inferior lenses, a common Huyghen's eye-piece would be the best. Such a combined eye-piece, with a tube four hundred and twenty mill. long, would raise the power of the instrument ninety seven per cent. The use of an achromatic condenser adapted for oblique illumination is necessary for high powers. The experiment was only successfully made with the best objectives of English artists, or with the excellent new Hartnack objectives.

According to his calculation, an objective of one mill. distance will give the first real image at a distance of two hundred mill. from the second chief point of the objective, and combined with an eye-piece in Listing's manner, having a power of twenty-five diameters by itself, and a tube four hundred and fifty mill. long, the magnifying power of the whole instrument would be five thousand diameters.

In the common arrangement of the microscope, the dioptric cardinal points are in the same order as in a concave lens, and the focal

distance of the whole microscope (not of the objective) would be equal to — .5 mill., with a magnifying power of four hundred diameters for a visual distance of two hundred mill.

In the Listing instrument the order of the cardinal points would be inverted and analogous to a convex lens, with a focal distance of the whole microscope equal to + .04 mill., with a magnifying power of five thousand diameters. In the first case the objective would have a focal distance of three mill.; in the last of one mill. The difference between the two chief points of the whole microscope is in both cases nearly equal to the whole length of the tube. In the last arrangement the whole microscope is analogous to a convex lens with very short focal distance.

In a second paper Professor Listing gives further facts concerning this arrangement. An objective with a focal distance of one mill. ($=\frac{1}{25}$), has the first image two hundred and one mill. distant from the second chief point. The first magnifying is $=$ 200. The middle eye-piece of two achromatic lenses with twenty five mill. focal distance, and fifteen mill. distance from each other, gives a focal distance of eighteen mill., and so the second magnifying is $=$ 9. This apparatus, having the objective and middle eye-piece combined with the five eye-pieces of Hartnack (magnifying from three and eight tenths to eleven diameters), gives a total power of from six thousand eight hundred and forty to nineteen thousand eight hundred diameters, with a tube of four hundred and forty mill.

Professor Listing advises that the lenses of the eye-piece should be made of fifteen mill. diameter, and with a correction for their distance. For the middle eye-piece, perhaps, lenses of quartz combined with a lower (1.61 to 1.59) flint glass should be used. In another place he gives a different construction for the middle eye-piece, analogous to an objective of two glasses, but with greater dimensions, and calculates the magnifying power of this to be from twenty two thousand to as much as twenty five thousand six hundred diameters.

Professor Listing observes that only the penetrating power would be raised by this method of construction, but that to a very considerable degree.

November 17, 1869.

The President in the chair. Thirty four persons present.

Prof. N. S. Shaler presented the following paper: —

Note on the Occurrence of the Remains of Tarandus rangifer Gray, at Big Bone Lick in Kentucky.

At a previous meeting of the Society, I presented the evidence going to support the conclusion that one of the large mammals of North America, the buffalo, had recently changed its limits, and had only ranged in the Ohio valley within the past few centuries. The same locality supplies us with evidence that the caribou existed in abundance in this river basin at a time anterior to the coming of the buffalo, and probably not very long after the disappearance of the *Elephas primigenius.* Since the coming of civilized man into America, the caribou has been confined to a narrow area in the north-east part of the continent; it is questionable whether it has ever ranged during this time south of the southern limit of the State of Maine.

The position in which these remains were found leaves the precise relationship in time of this species to the mammoths and mastodons a little questionable. There is, however, little doubt in my mind that, if not in existence during the later part of the time of these pachyderms, it came immediately after them. Its bones are found always below the line of the buffalo and the Virginia deer. The remains of this latter species are found only among the most recent deposits of the swamp.

The disappearance from this region of this eminently boreal animal immediately after the passing away of the ancient elephants from the Mississippi valley, goes to confirm a conclusion to which we are led by many other facts, viz., that the climatic change which closed the period of the mammoths was from cold to warmth, and not, as is generally assumed, an alteration of the reverse character.

Mr. S. H. Scudder exhibited a series of volumes which had just been bound for the library, containing the manuscripts and entomological memoranda left by the late Dr. T. W. Harris, and offered some remarks upon their peculiar value and interest.

There are twenty four volumes in all, mostly folios. Four of them contain miscellaneous notes and descriptions of insects arranged according to primary groups, with frequent sketches of the pen and pencil; a fifth is filled with his memoranda and drawings (many of them colored) of the earlier stages and metamorphoses of insects and particularly of Lepidoptera; entomological and zoölogical lectures delivered at Harvard College and elsewhere occupy two volumes; the manuscript of a portion of the State Report on insects an eighth; two more are filled with lists of insects received or sent in exchange with his numerous correspondents; the eleventh contains several manuscript lists of the insects of Massachusetts, including the original of the last one published by the State; four more are occupied by letters from his correspondents and his replies to them — the basis of his recent posthumous work; five are filled with laborious extracts from works then almost inaccessible, with tables and abstracts of classifications by various authors and with indices to the writings of Godart, Hübner, Cramer, Fallén, Donovan, Ochsenheimer and many others; another, a large quarto, embraces a complete alphabetical index to the North American Coleoptera described by Say; and another, the original of published descriptions of Neuroptera described by Say — partly in the handwriting of Say and partly as copied by Harris; a scrap-book of his own contains a manuscript copy of his first list of the Insects of Massachusetts and memoranda of exchanges, all in the clearest hand-writing, together with extracts, newspaper clippings and other memoranda; in addition to these there is a volume with complete lists of the insects in his American cabinet, referring to numbers upon the insects, and several blank books partially filled with revised but incomplete lists of the American Insects in his collection.

The Secretary announced that the Council, at its last meeting, had passed the following vote: —

Voted: — That the net proceeds of the celebration of the centennial anniversary of the birth of Humboldt, together with the money received from the sale of Professor Agassiz's Address, previous to Jan. 1, 1870, and the money subscribed at the solicitation of the Society's committee, be given to the Trustees of the Museum of Comparative Zoölogy at Harvard College, in trust, for the establishment of an endowment,

under the title of the Humboldt Scholarship, the income of which is to be solely applied, under the direction of the Faculty, toward the maintenance of one or more young and needy persons, engaged in study at said Museum.

Section of Entomology. November 24, 1869.

Mr. Edward Burgess in the chair. Twelve persons present.

The following paper was presented: —

AMERICAN LEPIDOPTERA. II. PHALÆNIDÆ LATR.

BY CHARLES S. MINOT.

At the June meeting of the section, I presented a paper entitled "American Lepidoptera, No. I," which contained descriptions of four new Geometridæ (*Phalænidæ* Latr.), and was published without further introduction. I should now like to say a few words on the intended purport of the series. I propose that it shall contain any papers of a miscellaneous nature, which may aid in completing our knowledge of the natural history of the Lepidoptera; such as descriptions of new species, or of the metamorphoses and lists of insects found in particular localities or States, with their times of appearance, and perhaps ultimately anatomical communications. The descriptions of new species will, for the present, be principally, if not entirely, confined to the Phalænidæ.

Cabenodes marginaria n. sp. ♂ Al. ex., 2.20 inch. Pale ochraceous, with innumerable atoms. Above, a broad, fuscous, marginal band, distinctly defined interiorly; cellular dots large, brown and very distinct. Beneath, a transverse, brunneous line, suffused exteriorly, corresponding with the inner margin of the band of the upper surface; cellular dots distinct. Fringe narrow, ochraceo-fuscous. Abdomen, front and thorax, ochraceous. Palpi distinct, projecting beyond the head, parallel, reddish brown. Thorax woolly, patagia larger than is usual in the genus. Fore wings subfalcate, hind wings subcaudate. Wings and body have a silken gloss.

This species is extremely interesting from the peculiar style of mark-

ing, which is unique, as far I know, in its genus. The only specimen I have seen was taken by myself near Muddy Pond, in West Roxbury, Mass., in the middle of August, 1869.

Cleora pulchraria n. sp. Al. ex., 1.50 inch. Light cinereous, marked with black. Above, primaries darker than secondaries, with two transverse dentate lines, dividing the wings, counting from the base, into the proportions of about 5 : 8 : 4, the inner line curving outwards, and the outer recurved; a dash along the basal half of the costa. Secondaries, with outer line of primaries continued, curving outwards. Fringe alternated with black at the terminations of the nervures. Beneath, on both wings, markings of upper surface repeated faintly. Primaries with median nervure, and the terminal portions of the nervules covered with black scales. Discal dots well defined above and beneath. Antennæ broadly pectinated in the male, filiform in the female, murinous. Eyes black, front gray, sometimes orange. Thorax, legs and abdomen, cinereous. Middle legs with one, and hind legs with two pairs of tibial spurs; I have a male specimen, however, which has two pairs of spurs on the middle legs.

This moth, which I have named the pretty Cleora, may be seen around Boston on the sunny days of September. It seems to be somewhat erratic in its appearance, for it comes out abundantly on some days, on others no specimens are to be seen. The only ones I have were given me by Mr. B. P. Mann of Cambridge. There are specimens in the Society's collection.

Anisopteryx strigularia n. sp. Al. ex., 1.60 inch. Murinous. Above, pale murinous. Primaries with a darker shade along the costa, suffused over the anterior two-thirds of the wing; innumerable minute strigulæ and three more or less suffused whitish spots on the costal margin, the outmost tending to become a transverse fascia. Secondaries without markings, nearly uniform in tint. Beneath, primaries with spots of upper surface repeated; a subapical patch of white, marked with transverse black strigulæ, which extend along the costal border to the base of the wing, and along the outer nearly to the posterior margin. Secondaries whitish, with fuliginous blotches and transverse strigulæ, which, being more numerous in some places than in others, give the wing a moss-like appearance; there is a transverse fascia, obliterated in the middle of the wings, but near each margin rendered distinct by the strigulæ which run somewhat together along the outer edge, producing dark blotches, the anterior of which is much the largest. Fringe white, alternated with black hairs at the

terminations of the nervures, except on the secondaries above. Antennæ filiform, brown. Head, eyes and thorax, blackish brown; abdomen above mouse-color, beneath, like the hind wings; femur murinous; tibia black and white. Hind tibia with two pairs of spurs.

This species is remarkable for imitating the markings of the rhopalocerous genus, *Chionobas*, which occurs in the same locality. If we follow Darwin, this fact may be explained by supposing that the peculiar moss-like markings serve to protect it from its foes by its close resemblance to the bare or lichen-covered rocks among which it is found. I am indebted to the kindness of Mr. Sanborn for specimens of this interesting Geometer. His specimens were, I believe, all taken in August, on the sides, and near the summit of Mount Washington. I do not know of its being found in any other locality. Some of the specimens were taken in a maple grove. One point is worthy of notice: that where *Chionobas* has a white band on the secondaries, this *Anisopteryx* has a dark one.

Fidonia Faxonii Minot. The male of this species may be distinguished by the entire absence of the white markings of the female. This species appears in August and September, not coming out until the very last of the former month. My remarks on its appearance and abundance apply to *Fidonia bicoloraria* Minot, but not to *F. Faxonii.*

Mr. W. H. Dall remarked that while passing over the Portage to the Yukon River, in Alaska, when the temperature was below zero of Fahrenheit, he shot a Canada jay, which had in its mouth the caterpillar of an Arctian; afterwards, when the thermometer was sixteen degrees below zero, he found one of the same caterpillars crawling upon the snow. On the middle of the frozen river, whenever the sun shone for a short time upon the crust, he saw upon the snow a species of *Lepisma* or *Podura* in great abundance, although the cold was intense. The caterpillar of *Vanessa Antiopa* was twice noticed alive during the winter, and the perfect insect was seen at Nulato, May 20th, when the nightly temperature was below freezing.

December 3, 1869.

The President in the chair. Sixteen persons present.

Dr. C. T. Jackson presented, in the name of Mr. Daniel McCain, specimens of native carbonate of magnesia from Greece, California, Maryland and Kansas.

That from Greece contains ninety nine per cent. of pure carbonate of magnesia, the rest, or one per cent , being siliceous matter.

The California specimen came from Alameda County, thirty six miles from San Francisco. It is of the same degree of purity as that from Greece.

The Maryland sample is rich enough for use, and contains seventy nine and two tenths per cent. of carbonate of magnesia.

The Kansas sample is very poor, containing but eight per cent. of carbonate of magnesia.

These minerals are used by the Union Stone Company in making calcined magnesia, which is one of the ingredients of their artificial stone, serving, when combined with chloride of magnesium, as the binding material.

Dr. Jackson gave a detailed account of the method of making the artificial stones, and of casting bas reliefs, busts and ornamental mouldings. He said the processes had been so improved that now artificial grindstones made of quartz-sand and of emery, had been constructed, which were as solid and durable as any natural stone. The emery wheels made of these materials are vastly better than those made with a paste of vulcanized india rubber, since they do not glaze, but wear away in such a manner as to always expose fresh particles of emery. He regarded this new manufacture as of great value for architecture and the mechanic arts, and as showing the importance of the mineral native carbonate of magnesia, which had been before used only for the manufacture of epsom salts, of which a limited supply only is wanted.

Professor N. S. Shaler offered some remarks on the relations of the rocks in the vicinity of Boston, of which the following is an abstract: —

The association of the several different sets of beds which are exposed in the neighborhood of Boston, is very difficult to determine

satisfactorily; being nearly destitute of fossils, and extremely complicated by disturbances, they have not presented a very inviting field for research. They have consequently received, as yet, very little attention. I venture to offer here a few suggestions concerning their relations, which may serve as a basis for future communications, and for the study of those who may have the desire to examine the same field.

There can be no doubt that the syenites, which make up so large a part of the exposed rocks of Eastern Massachusetts, are the oldest materials found in this region. The best exhibition of them, showing at once their general character and their relation to the superincumbent beds, is found in the immediate vicinity of Quincy, Mass. The extensive quarries of that neighborhood enable us to see very well all the different conditions of occurrence of this rock. The most remarkable fact which has come under my observation is the existence of planes of separation in this syenite, which cannot be referred to joints. The three or more planes of joint cleavings observable in these beds are clearly separable from this other set of planes which I cannot refer to any other cause than stratification, despite the opinion still generally entertained, that these rocks are of igneous origin, and owe their present structure to the actions which go on in a mass in a condition of igneous fluidity.[1] That I am not mistaken in referring these fractures to bedding, is, I believe, abundantly proven by the details of structure of the syenite itself, as well as by the relations it bears to the unquestionably stratified rocks which rest upon it. These planes in question show none of the characters which are presented by the true joint planes and fault's planes. There are no slickensides. They are only imperfectly parallel, and of very varying thickness. There are visible on the surface of considerable sheets of this rock, laid bare in the Mitchell quarry near Quincy, splitting along what I believe to be the plane of stratification, markings indistinguishable in appearance from ripple marks. This observation was made upon quite a small surface, so that it alone could hardly be trusted to determine the nature of these rocks. But upon the sides and the summit of the syenite, at various points, we find other evi-

[1] The admirable researches of Dr. T. Sterry Hunt into the constitution and origin of granite and syenites, have made it possible for the student to approach the question of the origin of rocks of these groups with a better chance of ascertaining the truth than would have been possible before the publication of the results obtained by them.

dence of their sedimentary character. If these syenites were of igneous origin, if they had been poured out before the deposition of the adjacent stratified beds, or thrust through them in a state of fusion, we should expect to find the usual marks of such actions. In the first of these cases the later sedimentary deposits would be found lying unconformably upon the syenite without any indication of transition; in the second we should expect to find a clear line of contact between the syenite and the sedimentary rocks, such as is always to be found where an intrusive mass of trappean matter cuts more ancient rocks. What we do find is that the imperfect bedding of the deeper portions of the syenite becomes more and more clearly defined as we pass towards the exterior of the mass, and gradually passes into unquestionably sedimentary rock. Every stage of this transition is not clearly seen, but enough is visible to satisfy any one that it really exists.

The first rocks, of quite unquestionable stratified origin, lie directly to the north of the Quincy syenite hills, and consist of clearly bedded sandstones, approaching quartzites in their character. These rocks have an unknown thickness, probably amounting to several hundred feet. Their general dip is northerly, with a variable angle of inclination which may be roughly averaged at twenty degrees. Above them the section is hidden for a distance which would give space for about three hundred feet of beds. Running the same north course across the break, we come upon the lowest of the Braintree series. This part of our section has a total thickness of about two hundred feet; its dip corresponds with the general inclination observable in the supposed stratification of the syenite, as well as that of the quartzites immediately above it. The whole of this Braintree series is fossiliferous, although it is only in about one hundred feet of the upper part that well preserved specimens of the characteristic fossils are found. It is composed of beds which were evidently at the time of their formation very uniform mud of a sea floor tolerably remote from land; and although much changed by metamorphic action, it is easily perceived that the whole set of beds contains no trace of shore deposits. Immediately beyond the exposure of the Braintree beds at Hayward's Landing, a dislocation has brought the thin bedded quartzites again to the surface. The alteration in these is so great that the rock has assumed something of the appearance of gneiss, and would by some be classed in that group of rocks.

If there be no undiscovered faults in the section from the Quincy

hills across the Braintree rocks in a northeasterly direction, the total thickness of unquestionably stratified beds is not far from one thousand feet. The uniform dip away from the Quincy Hills, shown by all the stratified beds on their flanks, may be regarded as sufficient proof that their elevation came after the deposition of these beds.

The region about the Quincy Hills does not afford any sufficient evidence concerning the section above the line of the Braintree series. At Weymouth Landing there is a great mass of schistose rocks which certainly are not far removed from this part of the section, but I have not yet succeeded in tracing any connection with it. I am inclined to think that they may be the beds between the Braintree slates and the quartzites before described.

In addition to the rocks already mentioned, there exist two other sets of beds, which are extremely developed in the environs of Boston, the relations of which are not easily determined. These are the series of the Roxbury conglomerate, and the set of beds which I have chosen to term from the point where they are seen to the best advantage, the Cambridge slates. The first of these consists of a mass of stratified pebbles, with intercalated sandstones and grits, the whole capped by a series of ripple marked sandstones about one hundred feet in thickness, and at certain points overlaid by masses of amygdaloidal trap. The total thickness of the formation remains yet a matter of question, but it cannot be less than twelve hundred to two thousand feet, and may be twice the latter amount. The whole is evidently a shallow water and shore deposit, being formed in a sea which became progressively more and more shallow, the uppermost beds affording evidence that they were deposited very near the shore.

The Cambridge slates show by their structure that they, like the Braintree slates, were deposited in deep water. In general character they resemble the latter rocks, being of dense argillaceous material, with little admixture of foreign substances, and presenting numerous planes of jointing, and one distinct cleavage along the line of stratification. The aggregate thickness disclosed in the Cambridge and Somerville sections is not far from two hundred feet; though owing to the fact that neither the base nor summit of the beds is observable, it is impossible to determine their depth. The only clear evidence of organic life consists in numerous but indistinct impressions of fucoids. A number of other peculiar forms have been found, but nothing satisfactory has yet been ascertained concerning them.

After several years of searching I have succeeded in finding a section which shows pretty clearly the relation of the Cambridge slates and Roxbury conglomerate. The most important part of this exposure has been uncovered by the extensive excavations now being made in the construction of the Chestnut Hill reservoir. In passing from the southern side of this reservoir in a nearly due north direction, we cross what seems to be a complete section of the slates and conglomerates of these two series of beds. On the south border of the lower reservoir at Chestnut Hill there is an outcrop of rocks in all important respects closely resembling the Cambridge slates. These are traceable for a distance of about seven hundred feet in a northerly direction across the floor of the reservoir, having a nearly north dip at an angle of about fifteen degrees. Immediately above these and without any discordance comes the first of the conglomerate beds, which consists of a bed about ten feet thick of pebbles mingled with slates. This is surmounted by about thirty feet of slates having a most perfect cleavage in the plane of stratification. It is not difficult to split a sheet a foot square having a thickness of not over one twentieth of an inch. Immediately above this slate, which was evidently deposited in deep water, for it is remarkably uniform in its character, the conglomerate comes in again and continues with its northern dip at an average angle of about fifteen degrees for a horizontal distance of over a mile. Near the edge of the Charles River alluvial flats, in Brighton, this conglomerate changes suddenly into a sandstone which is throughout marked with very distinct ripple lines, and bears other evidence of shallow water origin. Above this sandstone mass there comes a great expanse of amygdaloidal trap, which at some points is seen cutting the sandstone and again appears to have been poured out over its surface as a contemporaneous sheet. As is often the case near great outbreaks of this kind, there are at least two faults, one on either side of the dyke, which have produced considerable dislocation in the beds. These are the only faults visible in this most interesting section.

Although it is by no means certain as yet, still it may be assumed as probable that the Cambridge slates and Roxbury conglomerate belong to the same great series of beds. The coincidence in the direction of dip as well as the general character of the beds themselves renders it probable that it may eventually be found that these slates and conglomerates form part of the same series of beds as the Braintree series, and all belong to the primordial era. I am assured by

my friend, Rev. J. B. Perry, Assistant at the Museum in Cambridge that these conglomerates closely resemble beds of this age in New Hampshire, though I do not know that he agrees with me in this opinion concerning their age. As Mr. Perry's acquaintance with the primordial rocks of North America is more thorough than that of any living geologist, we may hope from him some satisfactory explanation concerning the precise position of these beds.

No fossils have as yet been found in the conglomerate; careful search may yet reveal something, however. It is to chance fossils and to a careful study of the character of the pebbles composing the conglomerate, that we must look for a solution of this question of the time of formation and conditions of deposition of this mass of beds.

Dr. Charles T. Jackson asked Mr. Shaler whether he considered greenstone porphyry to be a rock of igneous or aqueous origin. Mr. Shaler said he regarded it as igneous. Dr. Jackson then said there was an insensible passage of syenite into greenstone porphyry, as may be seen in numerous localities in Cohasset and elsewhere, and if one of these rocks is of igneous origin, the other must be also, of course. He then entered into an analysis of Mr. Shaler's arguments, and said that the obscurely stratified rocks on the borders of the great mass of syenite at Quincy, proved the igneous influence of the erupted syenite upon the upturned strata which it had elevated by its protrusion.

It is very common to find numerous fragments of stratified rocks through which syenite or granite has been protruded, mixed with the mass of injected rock. He had recorded a great number of such cases in his State Geological Reports; and Prof. Hitchcock had also observed them. Now these torn up fragments appear to be imbedded in the masses of syenite or granite, exactly as they are in trap and lava dykes, which burst through stratified rocks, and bear up the broken pieces imbedded in their paste, and there is every analogy between greenstone trap rocks, porphyries, syenites and granites, indicating for them all a formation by igneous fusion and elevation from below.

He did not deny the powerful influence of super-heated water on these igneous rocks, and referred to the researches of M. A. Daubrée on the formation of crystallized minerals in super-heated and strongly compressed water; but the water, in aiding metamorphosis of minerals, was only a helping agent; fire was the chief cause of the changes. (See Scrope on Volcanic Phenomena, and Daubrée's Work

on Metamorphism.) He would ask Mr. Shaler what his syenite was made of? What sediments were thus so strangely metamorphosed into a crystalline salt, like feldspar, the chief ingredient of syenite rocks? Was it an ordinary sandy sediment? If so, whence did it derive its potash and soda, twenty five pounds of which enter into the composition of every cubic foot of syenite. And again, why do we not see some unaltered grains, some coarse, unchanged gravel in syenites? Nothing of the sort is ever seen, but, on the contrary, clearly defined crystallized feldspar, mixed with distinct crystals of hornblende and a little quartz; all of which seem to have crystallized at a single jet from a stiff pasty mass which showed no subsidence of separate crystals or of intermixed gravel. Dr. Jackson also said that when it is alleged that crystallized rocks, like syenite or granite, are altered sedimentary rocks of aqueous origin, we require that the passage state should be demonstrated, and this has never been done by any one who has advocated such a metamorphosis.

From Nova Scotia to Georgia, and from the Atlantic to the Pacific coasts, all granites and syenites bear unequivocal evidence of their igneous origin and elevation through the superincumbent strata. It is too late to revive the old doctrines of Werner, for the same evidence with which Hutton overthrew that theory, still exists in the localities pointed out by the eminent Scotch geologist,[1] and similar evidence may be seen in almost any part of New England.

December 15, 1869.

The President in the chair. Thirty persons present.

The following paper was presented: —

Notes on the Mammals of Iowa. By J. A. Allen.

The present list of the mammals of Iowa is based mainly upon notes gathered during three months spent in that State in the summer of 1867, for the purpose of collecting and studying its animals and plants. It seeming desirable to make the list a complete one, a few

[1] See Playfair's illustrations of the Huttonian theory for descriptions of European localities.

species have been inserted upon the authority of other authors,[1] while a few others are given from their known occurrence in nearly all the adjoining States, though not to my knowledge yet reported from this. The whole number enumerated is forty eight, and probably but two or three remain to be added to perfect the list of the indigenous mammals of the State. Attention is also called to such others as are most likely to occur. If three or four northern ones be found to reach the northern parts of the State, the whole number, including the introduced house rats and mice, may be increased to about fifty five or fifty six, which is a number somewhat greater than is found in any of the Atlantic States, excluding the marine species, the seals and cetaceans.

Through the kindness of Dr. C. A. White, the able Director of the present Geological Survey of Iowa,—to whom, and to his excellent assistant, Mr. Orestes H. St. John, I am greatly indebted for assistance,—I was enabled to pass a considerable part of this time with one of his exploring parties, and to traverse large portions of nine counties.[2] These are situated a little to the southwest of the centre of the State, and embrace an area nearly sixty miles square; and to this region most of my special remarks refer. Large portions of this tract were then in a nearly primitive condition, many of its broad prairies being still undisturbed by the plow. Yet the hunter and the "first settler" had passed over it and destroyed or driven away many of the larger mammals. But the recent presence of these animals here was still fresh in the minds of the older settlers, many of whom had witnessed and assisted in their rapid extirpation.

Iowa being situated in a prairie region, it necessarily differs considerably in the general character of its fauna, and especially in respect to its mammalia, from that of the wooded portion of the United States to the eastward, as all who have given attention to the geographical distribution of animals must be aware. Yet we do not in this State fairly enter upon the so-called Middle Province of the con-

[1] The works to which I am chiefly indebted are the admirable volumes of Professor Spencer F. Baird, on the Mammals of North America, Audubon and Bachman's "Quadrupeds of North America," the late Major Robert Kennicott's papers on the Mammals of Northern Illinois (See Patent Office Reports, Agriculture, for 1856 and 1857, and Transactions of the Illinois State Agricultural Society, Vol. I, 1853-1854, p. 580), and Dr. F. V. Hayden's valuable article on the "Geology and Natural History of the Upper Missouri," published in the Transactions of the American Philosophical Society (Vol. XII, 2d series).

[2] Dallas, Guthrie, Boone, Greene, Carroll, Crawford, Sac, Calhoun and Audubon.

tinent, which differs so markedly, both in faunal and floral, from the Eastern Province. A great change in the fauna and flora is met with, however, at the point of junction of the wooded and woodless regions of the eastern half of the continent, which in the latitude of Iowa occurs more than a hundred miles to the eastward of that State. At this point as great and as abrupt a change occurs as usually takes place between two contiguous faunal districts, one of which lies to the north or to the south of the other, or where the line of division is an isothermal one,separating different climatic and zoölogical zones. A few only, if any, of the species embraced in this list seem to find their eastern limit of distribution in this State; but, with two or three exceptions, they range through southern Wisconsin, Illinois, and even into northwestern Indiana and southern Michigan, or to the eastern limit of the prairies. Also, with very few exceptions, none are restricted to it in either their northward or southward range. A few of the more northern species, whose southern range is restricted to the southern border of the Alleghanian fauna, may reach the northern counties of Iowa, as a few essentially southern species may approach, or even be found occasionally within its southern borders. Iowa is hence mainly embraced within the Carolinian fauna, at least so far as its mammals, birds and reptiles are concerned, though generally heretofore supposed to belong, in great part, at least, to the Alleghanian. Among the strictly prairie mammals represented, are at least four rodents (*Spermophilus tridecem-lineatus*, *S. Franklinii*, *Geomys bursarius*, *Hesperomys michiganensis*), two carnivores (*Canis latrans*, *Taxidea americana*), and at least one insectivore (*Scalops argentatus*). Only one eastern species, the red squirrel (*Sciurus hudsonius*), appears to find at the prairie line its western limit, if, as some have supposed, it be true that this animal does not range across the continent.[1] Hence the difference between the mammalian fauna of the prairies of the Upper Mississippi valley and that of the forest region to the eastward consists in the addition of a number of species peculiar to the prairies.

Since all the larger species of mammalia are everywhere rapidly disappearing before the revolutionizing influences of civilization, and since great and general changes occur in the faunal and floral features of every country when brought under cultivation, it becomes a matter of unusual interest to preserve as correct a record as possible of the primitive conditions of our own country in this respect, for com-

[1] See postea, p. 188.

parison with its subsequent altered status, as well as a history of the change. The natural history of Iowa is of course now far from an unexplored field, yet I find that no adequate record of its animals and plants, nor of those of the country immediately adjoining, has as yet been made. I have hence no hesitancy in presenting the few notes that follow concerning some of the mammals of this State.

FELIDÆ.

Two species of this family, from their known distribution, undoubtedly occur in portions of the State, but they cannot now be, and probably never were, very numerous. I met, however, with no evidences of their existence, and failed to make special inquiries concerning them. They are the following:

1. **Felis concolor** Linnæus.[1] (Panther.)

2. **Lynx rufus** Rafinesque. (Bay Lynx.)

The *L. canadensis* may also occur in the northern parts of the State. The *F. concolor*, however, owing to the open character of the country, can occur only as a straggler from more wooded regions.[2]

CANIDÆ.

3. **Canis lupus** Linn. (Common Wolf.)

Although wolves of this species were rather common less than twenty years since, they are now scarce, especially in the more settled districts. They are usually termed "mountain" wolves, in distinction from the prairie wolves.

4. **Canis latrans** Say. (Prairie Wolf.)

This species was formerly quite numerous, much more so even than the common wolf (*C. lupus*), but now, like that species, it is already in some sections nearly extirpated. I was informed that it was still common in the southern part of Guthrie county, where it not unfrequently was destructive to the lambs. It is said to far exceed the

[1] The nomenclature employed in this list is the same as that adopted by me recently in my "Catalogue of the Mammals of Massachusetts," so far as the species are the same. See Bulletin of the Museum of Comparative Zoölogy, No. VIII, October, 1869.

[2] Since writing the above, I have received from Dr. C. A. White, in kind response to recent inquiries of mine concerning the species of this family found in Iowa, as follows: "The panther has been known within our limits but *very* rarely. The common wild cat, or bay lynx, is occasionally found, but it is considered rare game. I do not know that the Canada lynx has ever been seen in Iowa."

common fox in boldness and cunning. In the Proceedings of the Philadelphia Academy of Natural Sciences (Vol. I, p. 188, 1842), it is stated that a specimen of this species, *from Illinois*, was presented to the Academy by Dr. Blanding. Mr. Kennicott states that it was once common in northern Illinois.

5. Vulpes vulgaris Fleming.[1] (Red Fox.)

Not apparently numerous in the counties in question, particularly at the southward. About Wall Lake and northwards they were reported to be common.[2]

6. Vulpes velox Aud. and Bach. (Swift Fox.)

Vulpes cinereo-argentatus Richardson, Faun. Bor. Am., I, 98, 1829; nec *Canis cinereo-argenteus* Erxleben, Syst. Regn. Animalis, 1777.

An animal described to me as the "Swift," which occurs here more or less frequently, is undoubtedly this species, though I have not known it before reported as occurring east of the Missouri. The character of the country in western Iowa differs little from that of eastern Nebraska, where this species is well known to occur. It is hence not very unexpected that it should exist in portions of Iowa. Dr. Richardson says it ranges north to the Saskatchewan river, which he gives as its northern limit.

7. Vulpes virginianus Rich. (Gray Fox.)

Canis cinereo-argenteus et virginianus Erxleben, Syst. Regn. Anim., 567, 1777.

Frequent, but not especially numerous.

[1] For a recent discussion of the relationship of the so-called *V. fulvus* with the *V. vulgaris* of the Old World, see the Bulletin of the Museum of Comparative Zoölogy, No. VIII, p. 159.

[2] I may here add that in Van Buren and Allegan counties in Michigan, four kinds of foxes are recognized by the hunters: the "cross," the "Samson," the "common red," and the "gray." The latter is undoubtedly the southern gray fox (*V. virginianus*), and the others different varieties of the common red fox. The "cross," so called, is much the rarer, and the red by far the most common. About one third of all taken are of the second variety, which from the very peculiar appearance of their fur are termed "Samson" foxes. They are described as having a coarse, crisp, woolly fur, appearing much as though they had been singed; hence their name of "Samson foxes." Their skins bring much less in market than those of the common red fox, while the animal is represented as less cunning and more easily trapped: they also have slightly different habits. I regret that I had no opportunity of examining specimens of them myself. Similar foxes, I am informed, occur in Massachusetts, where they are known to fox-hunters by the same singular name. This peculiar condition of the pelage is doubtless unnatural, and probably the result of disease, as I have in several instances seen an apparently similar modification of the pelage in the red squirrel (*Sciurus hudsonius*), which in one case extended through a whole litter.

MUSTELIDÆ.

8. **Putorius ermineus** Linn.[1] (Weasel.)

Weasels, probably mostly of this species, were reported to me as common; I saw, however, but one.

9. **Putorius vulgaris** Linn. (Little Weasel.)

From its known general range, this species must also occur more or less frequently, especially in the northern parts of the State.

10. **Putorius lutreolus** Cuvier. (Mink.)

P. vison Gapper, and *P. nigrescens* Aud. and Bach.[2]

Said to be common. The minks of the prairies are quite different in some respects from the more northern animal, as well as from those of the wooded region to the eastward. They are browner and their fur is much coarser and brings a much lower price in the market. Experienced trappers and fur dealers at the West repeatedly informed me that these differences are so considerable that they can always readily separate the prairie skins from the forest ones, as those from Illinois, for example, from those taken in Michigan. They also claim that there are two kinds of prairie mink, as of the northern mink, differing in size. This difference probably depends mainly upon sex and age, the males being much larger than the females.

11. **Lutra canadensis** Sabine. (Otter.)

Said to be common on the Raccoon rivers, and generally more or less so throughout the State.

12. **Mephitis mephitica** Baird. (Skunk.)

Common, and presents the same varieties in point of color as at the East.

13. **Taxidea americana** Waterhouse. (American Badger.)

This species is probably nearly as numerous as formerly. Though rarely seen, it being nocturnal, its burrows are frequently met with. Its thick, heavy body and short legs render it a rather clumsy animal, but with stealthy, cat-like habits it combines considerable cunning. In the night many expert animals become its prey. It is very powerful, and being armed with strong claws and teeth, is able to offer formidable resistance when attacked by a dog; it is, however, ex-

[1] In the Bulletin of the Museum of Comparative Zoölogy (No. VIII, pp. 168–174, 1869), the writer has given his reasons for believing there are but two species of weasel in the United States east of the Missouri, and that these are identical respectively with the *P. ermineus* and *P. vulgaris* of the Old World.

[2] In respect to the supposed distinctness of the American from the Old World minks, see my remarks in Bull. Mus. Comp. Zoöl., No. VIII, p. 175.

tremely docile to man, allowing itself to be handled, and unless teased, is said to rarely offer to scratch or bite. At Rippey, in Greene county, I saw a half grown one in confinement that had been caught by a boy a few days before, and carried home by him in his arms. When discovered they are said to lie flat and motionless on the ground, and if they think they are not seen will allow a person to pass within a few feet of them without moving. Though generally regarded as a harmless animal by the farmers, the bones and wool of lambs have been found in their burrows.[1]

URSIDÆ.

14. Procyon lotor Storr. (Raccoon.)

Common.

15. Ursus arctos Linn.[2] (Bear.)

The bear is reported to occur here, but I learned nothing of special interest respecting it. From the character of the country it evidently cannot now be common, however numerous it may formerly have been. Localities named after the bear, as Bear creeks, Bear groves, etc., indicate its former greater or less abundance here.

CERVIDÆ.

16. Cervus canadensis Erxl. (American Elk.)

Formerly numerous, but now extinct in most of the region under description. It is but a few years since good antlers of this species were common on the prairies, but through the combined action of

[1] The Mexican Badger (*Taxidea Berlandieri* Baird, U. S. and Mex. Bound. Sur. Rep., II, Mammals, 21, 1859; *Taxidea Berlandieri* Baird, Mam. N. Amer., 205), described as "Similar to the *T. americana* [*labradoria*], but smaller; above reddish gray, with a narrow white stripe extending from the muzzle to the root of the tail," from skulls of Mexican specimens and the MSS. notes of Dr. Berlandier, seems to be merely the smaller southern race of the common *T. americana*. It differs from it chiefly in being a little smaller, and, according to some reports, lighter in color. The probability seems very great that the slight differences in color pointed out are merely individual differences, although the *T. Berlandieri* may constitute a more or less well-marked climatal race.

[2] In the eighth number of the Bulletin of the Museum of Comparative Zoölogy, the writer has shown that it is impossible to satisfactorily characterize or distinguish more than a single species of land bear in the colder portion of the Northern Hemisphere, though it must be admitted that between the extremes of variation there are very great differences, more than would be required even to indicate a diversity of species, if the differences were constant, as they are most notably not, the most distinct forms gradually intergrading.

two destroying agencies they are now rarely met with, and only in an imperfect condition. In addition to the injury done them by the fires that annually pass over the wild prairies, the two species of *Spermophilus* and other rodents eat them, by which animals they are said to be in a short time completely devoured.

An old resident and hunter whom I met at New Jefferson, in Greene county, informed me that but seven years before (now nine years since), the elk were abundant in some parts of that county. Prior to this date he used to see herds nearly every day, and sometimes several in a day, some of them of very large size. During the early settlement of this part of Iowa they were of great value to the settlers, furnishing them with an abundance of excellent food when there was a scarcity of swine and other meat-yielding domestic animals. But, as has been the case too often in the history of the noblest game animals of this continent, they were frequently most ruthlessly and improvidently destroyed. In the severer weather of winter they were often driven to seek shelter and food in the vicinity of the settlements. At such times the people, not satisfied with killing enough for their present need, mercilessly engaged in an exterminating butchery. Rendered bold by their extremity, the elk were easily dispatched with such implements as axes and corn-knives. For years they were so numerous that the settlers could kill them whenever they desired to, but several severe winters and indiscriminate slaughter soon greatly reduced their numbers, and now only a few linger where formerly thousands lived, and these are rapidly disappearing. Their home here being chiefly the open country, they much sooner fall a prey to the "westward march of civilization," through the most merciless treatment they receive at the hands of the emigrant, than does the deer.

From June to October the elk are said to be always fat and in excellent condition for the table. Their flesh is described as being in texture intermediate between beef and mutton, but superior in flavor to either. In March the bucks shed their horns. As the new ones begin to sprout they leave the herd and keep by themselves, in small parties of about a dozen, till their horns are fully grown and hard, when they begin to "run," as the hunters term it, and again join the herd. About the twentieth of June the females are said to bring forth their young. Towards autumn, when the calves have become large and strong, the elk begin to gather in large herds. The horns appear disproportionately large, especially when "in the velvet," at

which time the main branches are as thick as one's arm, and their appearance is far from pleasing.

17. Cervus virginianus Boddært. (Common deer.)

More or less common, but steadily decreasing in numbers. I was informed that in some sections they were on the increase, owing to the fact that they were beginning to have a more favorable range, through the gradual extension of the forests, — due to the protection of the woodlands from the annual fires that formerly swept over the country, and which probably more than any other cause tended to keep the timber-tracts within their former restricted areas. But it does not seem that this increase of the deer can be more than temporary, unless stringent measures are taken to protect them. If exposed to the indiscriminate slaughter to which this animal has generally been subject elsewhere, it must certainly soon disappear, as it has already done over so large a portion of the United States east of the Mississippi.

The white-tailed deer (*C. leucurus*), according to Dr. Hayden,[1] should be included among the mammals of Iowa, since he gives its range as extending eastward to the Big Sioux river and Council Bluffs. It does not, however, seem to me to be distinct from the *C. virginianus*.

BOVIDÆ.

18. Bos americanus Gmelin. (American Buffalo.)

Now nearly exterminated in all parts of the State, though numerous in the northwestern counties at a comparatively recent date. Two years since I was informed that a few still remained in that section, and that up to that time one or more had been killed every year as far south as Greene county. Further north they were represented as being more common, but that no herds were met with south of the Sioux river, and rarely east of the Missouri. Those found further east were only stragglers or wanderers from the herds, that in most cases had probably been driven off by the Indians.

VESPERTILIONIDÆ.

Bats of at least two species were observed flying about the groves, but I procured no specimens. They were not, however, numerous, and were mainly seen near the timber. A prairie country cannot,

[1] Transact. Amer. Phil. Soc., Vol. XII, 2d series. p. 149.

evidently, afford such animals favorable haunts; but they will doubtless increase with the further settlement of the country, when more or less open buildings will afford them convenient places of resort. The following species, from their general known distribution, doubtless occur in most parts of the State.

19. **Nycticejus crepuscularis** H. Allen. (Black-faced Bat.)
20. **Lasiurus noveboracensis** Tomes. (Red Bat.)
21. **Lasiurus cinereus** H. Allen.[1] (Hoary Bat.)
22. **Scotophilus fuscus** H. Allen. (Brown Bat.)
23. **Scotophilus noctivagans** H. Allen. (Silvery Bat.)
24. **Scotophilus georgianus** H. Allen. (Georgia Bat.)
25. **Vespertilio subulatus** Say. (Little Brown Bat.)

SORECIDÆ.

During the short time I passed in this State I met with no examples of this family, though several species undoubtedly occur there. Of the long-tailed shrews, or true *Sorices*, among the species that may be looked for are *Sorex platyrhinus*, *S. Richardsonii*, *S.* "*Haydeni*," and *S.* "*Hoyi*." The following, from their ascertained distribution, must be present, specimens of the latter being in fact already known from this State.

26. **Sorex Cooperi** Bachman. (Cooper's Shrew.)
27. **Blarina brevicauda** Baird. (Mole Shrew.)

TALPIDÆ.

28. **Scalops argentatus** Bachman. (Silvery Mole.)

This species is well known to occur in the State, but it does not appear to be very numerous.

29. **Condylura cristata** Illiger. (Star-nosed Mole.)

This species having been traced westward to the Mississippi, it doubtless occurs in eastern Iowa, but probably only as a rather rare species. I can find, however, no specimens of it reported from there. It is said to inhabit the prairies of Illinois.[2]

The Brewer's Mole (*Scalops Breweri*) may also be met with here, though it has not yet been found, so far as I am aware, west of the State of Ohio.

[1] Probably not distinct from *L. noveboracensis*.

[2] Kennicott, Patent Office Rep., Agr., 1857, p. 101.

SCIURIDÆ.

30. Sciurus carolinensis Gmelin. (Gray Squirrel.)

Said to be more or less numerous in the groves along the water courses. I saw, however, but very few.

31. Sciurus ludovicianus Custis. (Western Fox Squirrel.)

Common in the same situations as the preceding species; I saw it much more frequently. It was, however, far less numerous than I found it to be in Ogle county, Illinois, or in southern Michigan, in both of which localities there was a much greater predominance of forest. In these latter localities the preceding (*S. carolinensis*) was also excessively abundant, both in its black and gray colors, and in every intermediate stage between gray and black. The young, as I have already mentioned in another connection,[1] more frequently represent the intermediate stage, their fur presenting the annulated appearance mentioned by Prof. Baird as characterizing intermediate color varieties.[2] This form of *S. carolinensis* was more especially abundant in Illinois, where the greater part of the large number of specimens I examined were of the dusky, annulate-haired type; they were also all young.

32. Sciurus hudsonius Pallas. (Chickare. Red Squirrel.)

This species does not appear to occur in the parts of Iowa I visited. I saw not a single specimen, and although I made extended inquiries respecting it, could not learn that it had ever been seen here. I also found it unknown in Ogle county, Illinois (one hundred miles west from Chicago), though said to occur sparingly in some portions of northern Illinois, by Mr. R. Kennicott,[3] and also in northern Missouri and central Iowa; but in respect to the latter locality I think he may have been mistaken. I never anywhere, however, saw it so numerous as I have found it to be in southern Michigan (Van Buren and Allegan counties). Somewhat to the northward of Iowa, as in the forest region of Minnesota, it is said to be very numerous, and to extend thence far to the westward. Dr. Hayden says it occurs on the eastern side of the Black Hills, in Nebraska.[4]

[1] Bulletin Mus. Comp. Zoölogy, No. VIII, p. 222.

[2] Mammals of North America, p. 244.

[3] Patent Office Rep. Agriculture, 1856, p. 68.

[4] I am far from sure that either of the supposed species called *Sciurus Fremonti*, *S. Richardsoni* and *S. Douglassi* are distinct from the common *S. hudsonius* of the eastern part of the continent. The differences between them are very trivial, and in respect to what these are, authors are by no means unanimous. They are gen-

33. Pteromys volucella Cuvier. (Flying Squirrel.)

Not common. From its peculiar nocturnal habits this species is one easily overlooked. From its known range it must occur in the State.

34. Tamias striatus Baird. (Striped Squirrel.)

Abundant in and near the thickets and groves.

35. Spermophilus tridecem-lineatus Aud. and Bach. (Striped Prairie Squirrel. Striped Gopher.)

Abundant, and to the farmers a destructive pest. Seen almost daily, both on the wild prairie and in the cultivated fields. They are active throughout the summer, and quite destructive to the young corn in the spring, the kernel of which they dig up, and thus destroy the crop. It is said, however, to be less frequently noticed during the summer, when the grass is high, than earlier. Their burrows run usually but a few inches below the surface, but sometimes extend horizontally for the distance of ten feet, though usually much less.[1]

36. Spermophilus Franklini Richardson. (Gray Prairie Squirrel. Gray Gopher.)

Abundant, and, in proportion to its numbers, far more destructive than the preceding (*S. tridecem-lineatus*). When very numerous they sometimes destroy acres of newly planted corn by eating the

erally slight variations in size, the northern and Rocky Mountain species being generally a little larger than the restricted *S. hudsonius*, but differing only as the representatives of a single species would be expected to under similar differences of habitat. There are no essential differences in color, the variation in this respect being in no case greater than specimens from different localities in New England present, as I have before pointed out (Bull. Mus. Comp. Zoöl., No. VIII, p. 223). Specimens from northern Maine have just as good claims for specific distinctness from those of eastern Massachusetts as either of the above-named supposed species have to be regarded as specifically distinct from the *S. hudsonius*. They differ in color and in the texture of the fur, the Maine specimens in question being grayer, with thicker, heavier pelage, and larger in size. Those from some localities have also a relatively shorter tail, differences precisely similar to those urged as distinguishing severally these supposed species, and equally great in degree. The habitat of *S. hudsonius*, then, it seems to me, really extends throughout the northern part of the continent, from the Atlantic to the Pacific. Intelligent travellers and naturalists perfectly familiar with the *S. hudsonius* at the East, who have visited the region inhabited by the other supposed species, as Alaska and the Rocky Mountains, report that they saw nothing about the red squirrel they met with there, either in habits or otherwise, that led them to suspect it to be at all different from *S. hudsonius*.

[1] For a very complete account of the habits of this species, see the late Robert Kennicott's excellent papers on the Mammals of Illinois, in the Patent Office Reports (Agriculture) for 1856 and 1857 (1856, p. 74).

seed. During the spring months it is generally numerous, but after about the first of June is rarely observed, and all my efforts to obtain specimens, both in this State and in Illinois, where it is equally common, were ineffectual. The burrows of this species run to the depth of three or four feet, and extend to a considerable distance.

The Prairie Dog (*Cynomys ludovicianus*), so characteristic of the more western prairies, is not met with to the eastward of the Missouri river. Dr. Hayden says the first village he met with in ascending the Missouri was about ten miles below the mouth of the Niobrara.[1] Mr. Cyrus Thomas erroneously includes this animal in his catalogue of the "Mammals of Illinois," published in Vol. IV of the Transactions of the Illinois State Agricultural Society.

37. Arctomys monax Gmelin. (Woodchuck. Marmot.)

This animal appears also to be absent from *western* Iowa. I met with but a single individual who had seen it in the State. He had formerly lived in Davis county, in the southeastern part, where he informs me it occurs, as also in the adjoining counties of Missouri. On this authority it is included in the present list.

38. Castor fiber Linn. (Beaver.)

Reported to still exist on the South Raccoon river, but nearly or quite exterminated in most of the eastern and southern portions of the State. A gentleman residing in the southern part of Dallas county informed me that when he settled there, eighteen years before, he being one of the first settlers of the county, the beaver was then common there. He said it was now quite exterminated in that vicinity, none having been seen for a considerable period. From the frequent occurrence of creeks in Iowa called by the name of this animal, it seems probable that it was once numerous here.

39. Geomys bursarius Richardson. (Pouched or Pocket Gopher.)

Exceedingly numerous everywhere, and a great pest. The farmers regard it as agriculturally the "great curse of the country." In some localities it destroys the fruit trees, the groves planted for shade and the osage-orange hedges, by feeding upon their roots in winter. It seems to be nowhere on the decrease, as from its peculiar habits it is difficult to destroy. As the animal seldom appears above the surface of the ground, and only at night, one may reside for years where they are numerous without seeing one. The moist and the dry portions of the prairie are alike haunted by them; and the farmer too

[1] Transact. Amer. Phil. Soc., Vol. XII, 2d series, p. 145.

often sees their unwelcome hillocks thrown up night after night in his garden, or within a few feet of his door. As their burrows are always closed, few persons know how to trap them. A few farmers have been successful in poisoning them with strychnine, and now and then one is shot. To shoot them it is necessary to open their burrows and watch with a gun kept in readiness to fire the instant they appear at the opening to close it, as they show their head only, and for merely an instant. The gopher will allow no light to enter its burrow, and when it is broken into it hastens to repair the breach. In trapping them an opening is made into their galleries, through which a small steel trap is inserted as far as it conveniently can be with the hand, and the opening then partially closed. The animal hastening to close the opening must generally pass over the trap. Occasionally, however, the trap is found pushed up into the opening and firmly wedged there with the impacted earth, in which case it is usually unsprung. The gopher is hence often credited with a degree of cunning far beyond what it possesses, the safe removal of the trap being purely accidental on the part of the animal. As the burrows are extensive, with many branches, it is impossible to tell on which side of the opening the occupant may be, and hence coming from the side opposite to that where the trap is placed, it often succeeds in closing the hole without being captured.[1]

This animal is said to be unable to swim, and that it is often drowned in its burrows, when they are inundated by the sudden rise of the prairie streams.[2] Whether or not large rivers form impassable barriers to it, it seems to be well substantiated that while this animal occurs on the Iowa side of the Mississippi and in central Illinois, or throughout that part of the latter State south and east of the Illinois river, it does not exist in that portion situated between the Illinois and the Mississippi. Mr. Kennicott refers to his having heard this reported, but he was unable to vouch for the truthfulness of the account. When in this section of Illinois, however, I was repeatedly informed by competent and trustworthy observers who had resided in this part of the State since its first settlement, and who had traversed it extensively, that the pocket gopher did not exist in that portion of Illinois between these rivers. This fact seems the more strange when

[1] For a detailed account of the habits of this interesting species, see Kennicott's papers on the Mammals of Illinois, in the Patent Office Report on Agriculture for 1857, p. 72.

[2] R. Kennicott. Patent Office Rep., Agriculture, 1857, p. 75.

we remember that the gopher is common in portions of Wisconsin, being in fact very numerous in Winnebago and Fond du Lac counties, as I have myself ascertained.

The *Perognathus fasciatus* may well be expected to occur in southwestern Iowa, since it is well known to exist in northeastern Kansas, not many miles from the Iowa border.

MURIDÆ.

40. Jaculus hudsonius Baird. (Jumping Mouse.)

Doubtless not uncommon, since it is numerous in neighboring portions of Wisconsin and Illinois.

41. Hesperomys leucopus Wagner. (White-footed Mouse.)

A species I take to be this was not uncommon. From the locality it may be what has been recognized by Professor Baird as the *H. sonoriensis* of Le Conte,[1] described by the latter gentleman from a specimen from Sonora. Specimens are referred to it by Professor Baird from Fort Union and other localities in northwestern Dacotah, and from various intermediate points southward to Texas and New Mexico ; the *H. leucopus* of Richardson from the Saskatchawan being also referred to it, it is thus recognized as having a considerable range in latitude. The western limit of *H. leucopus* is given by Professor Baird as the Mississippi. As my specimens are not appreciably different from *H. leucopus* from Massachusetts, one is left to two alternatives ; either that of regarding the *H. leucopus* as ranging westward across the State of Iowa to the Missouri, or of considering *H. sonoriensis* as indistinguishable as a species from *H. leucopus*. I am the more inclined to the latter opinion from the almost exact resemblance which authentic specimens of the former that I have examined bear to others unquestionably of *H. leucopus*. Its recognized wide distribution in latitude does not at all accord with its supposed limited range eastward, in a region of so uniform a character as the one now in question. In regard to *H. sonoriensis*, Professor Baird observes : "This species has the general characters of the white-footed mouse of the eastern States ; and it is only after the comparison of extensive series that I have been able to detect differences which, though slight, are so constant and of such a character as to appear something more than a mere local variation. I shall, however, be obliged to indicate the differences rather by comparison than as absolute characters."

[1] Mam. N. Amer., p. 474.

As I have previously observed,[1] I believe that a considerable number of merely nominal species of *Hesperomys* have been recognized as valid, and in a group presenting such a wide range of variation in color and in the proportions of the different parts of the body as different representatives of even the restricted *H. leucopus* do, I fail to see the propriety of basing species on such intangible differences as distinguish *H. sonoriensis*.

42. Hesperomys michiganensis Wagner. (Prairie White-footed Mouse.)

Apparently common; several specimens taken. I made my first acquaintance with this species in life, in Ogle county, Illinois, where I found a pair in June in their nest under a flat stone at the edge of a cornfield. A newly born litter of young were attached to the teats of the female. The contrast of color between the dorsal and ventral areas of the body was well marked, and the line of separation along the sides clearly defined.[2]

The Wood Rat (*Neotoma floridana*) has been found in northwestern Kansas, about a hundred miles from the southwestern corner of Iowa, and judging from what is known of its distribution, it may be expected to occur in portions of the latter State.

43. Arvicola riparius Ord. (Meadow Mouse.)

Apparently common. I obtained several specimens, some of which are scarcely appreciably different from Massachusetts ones; others more resemble some obtained by me in Northern Illinois. In the latter locality I obtained young specimens in the fall that in general characters are referable to *A. riparius*, but which in the character of the fur are quite different from the ordinary type of this species at the same age at the East, the coat being longer and heavier; the longer hairs presented a more bristly appearance, many of which were hoary, thus giving a well-marked grizzly aspect to the pelage. In the long heavy coat it seems to correspond with the prairie variety mentioned by Prof. Baird, and to which he applied the name *longipils*, in reference to this peculiarity; but they differ from it in color, which may, however, and most probably does, result from a difference in age. The longer and coarser pelage noticeable in the *Arvicola* of the prairie is similar to that previously referred to in this paper as characterizing the prairie minks.

[1] Bull. Mus. Comp. Zoöl., No. VIII, p. 227.

[2] Compare with this the remarks of Mr. Kennicott and Prof. Baird in reference to "*Mus Bairdii*." Pat. Office Rep., Agr., 1856, p. 92; Mam. N. Amer., p. 477.

The two following species of *Arvicola* also doubtless exist, at least in portions of the State, as they are not uncommon in the adjoining State of Illinois.

44. **Arvicola austera** LeConte. (Prairie Meadow Mouse.)

45. **Arvicola pinetorum** LeConte. (Pine Mouse.)

46. **Fiber zibethicus** Cuvier. (Muskrat.)

Common along the streams.

LEPORIDÆ.

47. **Lepus sylvaticus** Bachman. (Gray Rabbit.)

Common about the groves and thickets. In respect to the distribution of this species in Iowa, Dr. White has written me as follows: "It occurs all over the State, but is not common in the northwestern part. Indeed it is most common in the most cultivated districts, especially in southern and southeastern Iowa." He adds that this is the only species of rabbit occurring in the State, to his knowledge.

It is probable that the Prairie Hare (*L. campestris* Bach.), the western representative of the *L. americanus* of the northern tier of States east of the Mississippi (if there is, in fact, any reason to consider them distinct), may occur in the northern part of the State.

DIDELPHIDÆ.

48. **Didelphys virginiana** Shaw. (Opossum.)

From its general known distribution, this species might well be expected to be more or less frequent in the southern part of the State. Dr. White, however, informs me that it is very rare there, but that he saw two specimens some years since in the southeastern part.

January 5, 1870.

Mr. R. C. Greenleaf in the chair. Twenty one members present.

Drs. G. A. Maack and Francis R. Staehli and Messrs. James H. Blake, Richard Bliss, Jr., and A. R. Crandall of the Museum of Comparative Zoölogy at Cambridge, Mr. Frederic W. Wheildon of Concord, Mr. Frederic A. Clapp of Dorchester, Mr. Timothy O. Fuller of Newton, Mr. Charles J.

Maynard of Newtonville, Mr. Frank H. Nutter of W. Roxbury, and Messrs. George F. Child, A. A. Childs, D. M. Fisk, Emile Fontarive, Robert A. Shailer, Hollis Thayer, John H. Thorndike and William F. Whitney of Boston, were elected Resident Members.

Section of Microscopy. January 12, 1870.

Mr. R. C. Greenleaf in the chair. Eight members present.

Mr. Stodder referred to a communication of Mr. R. C. Greenleaf,[1] on a specimen of *Aulacodiscus oreganus* Bail., prepared by Mr. Samuels, which in the process of mounting separated into two plates; one being the outer, and the other the inner plate of one valve.

A few days since a similar thing happened to Mr. Samuels when mounting another specimen of the same species. The Diatom separated into two pieces, the inner and outer plates of one valve, as Mr. Samuels supposed. But a careful inspection of the specimen, which was exhibited to the Section, indicated an entirely different origin. One disc was a perfect *A. oreganus*, with all the characters of that species, having ten rays, and "feet." The other was more hyaline, the umbilicus less distinct, the granules and "feet" imperfectly developed, and had eleven rays and "feet." Mr. Stodder's explanation of the appearances—if Mr. Samuels was not mistaken as to the facts — is that one disc is the parent, and the other a valve of a new frustule, which was forming in the process of self-division, the growth of which was stopped before it had come to maturity. Ehrenberg and some other naturalists have made the number of rays in such forms a specific character; Bailey and others have rejected this principle of classification, but here for the first time we have positive evidence that a form with eleven rays has been derived directly from one of ten rays. Such a change of characters in one order of plants being authentically established, it is a reasonable inference that all other orders may be liable to similar changes, and therefore great caution should be used in allowing specific value to unimportant characters.

[1] These Proceedings, Vol. XII, p. 361.

January 19, 1870.

Vice President Dr. C. T. Jackson in the chair. Forty three persons present.

The following paper was read: —

On the Parallel Ridges of Glacial Drift in Eastern Massachusetts, with some Remarks on the Glacial Period. By N. S. Shaler, Professor of Palæontology, H. U.

In the immediate neighborhood of Boston the unstratified drift does not lie in anything like a continuous sheet, but is distributed in long and rather narrow ridges, which, with varying height, on account of long continued denudation, may be traced for miles across the country. These ridges are particularly conspicuous in the islands of the harbor of Boston, where, although much worn by the action of the tidal currents, the parallelism is quite apparent. The fact of the existence of this symmetry in the arrangement of these islands was first remarked by Count Pourtales, assistant in the Coast Survey corps. He perceived, what may be readily observed in the accurate map of that survey, that there are two sets of trends exhibited in the arrangement of these islands, the principal being from northwest to southeast, and the other and somewhat subordinate set of ranges running from northeast to southwest, or directly at right angles to the other set. Although the intersecting water level makes these ridges somewhat more conspicuous in the harbor than upon the land, they are, in fact, better marked upon the main land than among the islands. All the high land of Chelsea and Winthrop is composed of half a dozen or more tolerably lofty drift ridges, which retain a remarkable parallelism though varying a good deal in altitude, and somewhat in transverse extent. The spaces between these ridges are not quite cut down to the sea level at all points, though at no point much elevated above it. The effect of marine denudation at a time when this shore region was more depressed than it is now, is evident throughout this group of drift hills. The greater part of East Boston seems to be a ridge corresponding in course with those in Chelsea. The general trend of these ridges is northwest and southeast, with few degrees of variation in some cases, but on the whole with as much regularity as is ordinarily observable in any such geographical features. Passing to the westward we find in Charlestown, Somerville, Cam-

bridge and part of Medford, the same sort of ridges with a similar trend. One of these ridges beginning in Charlestown, and continued through Somerville and Medford to the borders of West Cambridge, has a length of five miles. At certain points in this group of drift hills we perceive indications of the northeast and southwest ridges, but on the whole the ridges conform in course with those in Chelsea.

On the south side of Charles River, some of the loftiest ridges, such as Corey's Hill, are composed for the upper hundred feet, at least, of this drift material, and the direction of their axes is approximately the same as those in Cambridge. In Boston and South Boston the drift hills, though not so clearly defined as those just mentioned, seem to belong to the same class of northwest and southeast ridges. A more extended comparison of the courses of the drift hills of the coast would not be desirable here; enough has been given to make it clear to those who are conversant with the facts that there exists the same system of trends in the ridges on the main land that Count Pourtales has pointed out in the harbor.

It is an interesting question to determine whether these ridges have been formed as such, or are the remnants of more extensive masses; upon the determination of this question must rest many important conclusions concerning the nature of the operations which took place during the glacial period.

A comparison of the sections given at various points in the islands of the harbor, at Chelsea, Somerville, Cambridge, Brighton, South Boston and elsewhere, has shown that through this region the drift is remarkably similar at the same height above the sea. The mass of this drift has a structure which is of a very inexplicable character; it cannot be called stratified in any ordinary sense of the word; the pebbles are of various sizes, from five foot boulders down to coarse sand, but the whole packed in a fine mud, which so binds the materials together that in the lower parts of the mass, where it has been subjected to considerable pressure, it is almost as hard as parts of the Roxbury conglomerate, and resembles it in a most surprising and suggestive manner. This peculiar feature of a mud cement binding the mass together has been long ago remarked by Professor Agassiz as unquestionable evidence of the fact that this mass could not have been deposited under the ordinary conditions of stratified materials. In sections such as are exhibited on Somerville hill, or at several points in Chelsea, this mass is seen to have a thickness of at least one hundred feet. Throughout this extensive section there is nothing which can be recognized as

stratification. There are, however, certain features which distinguish this mass from the ordinary moraines, such as may be found in contact with existing glaciers in Switzerland, or in lower positions in the valleys of the same region, where similar accumulations mark the successive stages of retreat of the ancient ice streams. There is a much greater uniformity in the condition of the materials; a far larger part of the boulders, amounting to about two or three per cent., are distinctly scored or scratched. At certain points, though the paste still envelops the pebbles, there is a certain bedding to the mass, produced by pebbles of a similar size being more abundant on particular levels. On the very summits of these drift ridges, we generally find the large boulders very abundant; indeed it seems at first as if there had been some peculiar change in the conditions of deposition at the time when these boulders were accumulated. A careful examination has convinced me that in most cases these abundant erratics on the summits of the hills are the remains of that part of the section which has disappeared since the formation of these ridges. A comparison of the frequency of occurrence of these boulders in the remaining parts of the hills and on the surface, will satisfy any one that there must have been a very large amount of denudation since their formation. With this sort of a measure we cannot suppose that the amount of height lost by these hills has been much less than one hundred feet.

Should the student feel any doubt concerning the essentially unstratified character of these drift beds, he has only to compare the sections exposed around the base of many of these ridges where the same materials which once formed a part of the mass of the hills have been worn away and stratified by the action of the sea at a time when the emergence of the land at the close of the glacial period had not been completed. He will there see that the pebbles are all deposited separately from the sand, and this in turn apart from the mud, the order of the deposits being precisely that which is always found where such varied materials are acted upon in the tidal currents which sweep every sea shore. Although at first disposed not to accept that view, I have been compelled by an extensive study of these drifts to adopt the theory advanced by Agassiz, that these drift deposits are essentially the work of some other agent of deposition than water. I see no other view likely to meet these facts than that offered by Professor Agassiz, *i. e.*, that this mass is the material which rested in and upon the glacial sheet at the close of its history

and was dropped in the place where it lies by the melting of the ice which held it. The only difficulty in this view is to conceive that such a mass of detritus as that in question could have ever been contained in a glacial stream. There can be little doubt that this drift must have been, when originally deposited, at least one hundred and fifty feet thick. It is very doubtful whether the thickest of the Swiss glaciers, the Aletsch or the Mer de Glace would, if melted down, deposit a coating of more than twenty feet in average thickness upon their floors, and yet these have immense feeding grounds, enormous tracts of mountain side which are constantly throwing masses of detritus into the glacial streams. Although the evidence entitles us to suppose that the continental glacier, to whose action we would attribute these detrital hills, was immensely thicker than the valley glaciers of Switzerland, yet the region projecting above the level of the ice must have been small,—too insignificant indeed to have furnished any considerable part of the drift materials.

We are thus driven to suppose that the mass of this sheet of drift, the relics of which alone we see in the hills we are studying, must have been rent from the floor of the glacier as it moved along. The riving power of the movement which scored our hills with the deep grooves must have been sufficient to have torn up large amounts of fragments from its bed. As we have evidence that the glacial sheet was at many points over half a mile in depth, we may without difficulty allow it the power of riving this supply of detritus from the rock floors over which it moved; it is difficult, however, to perceive how the supply of fragments could have been lifted into the body of the ice sheet in order to have been carried along with it. We are not prepared to see how it would be possible for a glacier to push along with its advance a stratum of one hundred feet or more of pebbles, mud and sand. We must believe that there was an admixture of ice with the drift, so that it could move as ice. It is not easy to see how a pebble could be lifted to a position in the glacier above the point where it was torn from the bed rock. Yet that there was some such lifting action, there is abundant evidence. Nothing is more common than to find fragments of a peculiar bed rock many feet above the base of the drift section. The admirable exposure in the cutting made for a sewer in the College yard in Cambridge, shows this feature very clearly; large masses of the clay slate grooved and scratched by long working on the solid rock, were found at a height of several feet above the bed from which they had been torn.

If we accept the general conclusion, which it does not seem possible to escape, that these drift hills are the remnants of the deposit made at the melting of the great glacier, then we must believe that this coating of detrital matter covered with something like uniformity the whole of this part of the coast. It would necessarily vary a great deal in thickness at particular points, but it should have existed everywhere. If with this view we compare the structure of these hills at points some miles apart, we find at once abundant evidence in its support. The actual height of the summits of these drift hills corresponds pretty closely. The character of the deposit is also very similar indeed. The mineralogical nature of the fragments of the mass may differ greatly, for in all cases a large part of the mass is made up of materials which can be referred to neighboring rocks; that is to rocks situated within a range of fifty miles or so; but the nature of the deposit remains unchanged. Such a comparison will soon exclude the possibility of these ridges being the terminal or lateral moraines of a glacier, which supposition, moreover, is sufficiently met by a mere reference to their geographical position. The relation of the separate masses of drift is irreconcilable with any other hypothesis than that they are the remains of what was once a continuous sheet.

The only difficulty of a serious character is to answer the question which at once arises as to the cause of the peculiar parallelism of the two series of ridges which are discernible in this region. The few who are familiar with the geology of the environs of Boston may have noticed that there are two lines of upheaval in this part of Massachusetts, each marked by dykes and more or less considerable dislocations of strata. One of these, and by far the most considerable, whether measured by the frequency of the ridges or by the height of the dislocations which it produces, has a course of about northwest and southeast; the other less important, but clearly marked trend, is from the northeast to southwest. It will be at once observed that these two systems of directions, those of the drift hills and those observed in the series of dislocations in this district, correspond exactly. With this amount of information it is by no means difficult for the observer to perceive that it becomes at once probable that these drift hills are only cappings of glacial detritus lying upon ridges of the more solid bed rock of the country, the solid pedestal having prevented the wearing action of the streams from affecting the detrital matter which rested upon them. Wherever it is possible to get

access to the base of these hills, it is readily seen that such is in fact the case, the ridges of rock are distinctly traceable on the flanks of the drift hills of Somerville, Brookline and Brighton. Even where, as is often the case, the wash from the upper part of the hills has covered their flanks so that it is not possible to get access to the protecting buttresses of rock, there is generally other evidence to show that the drift ridge has a rock ridge beneath it. Allusion has already been made to the fact that while the drift material does not indicate anything which can be properly called stratification, there is nevertheless a certain obscure bedding near the top of the mass. Now it is easily seen, as, for example, at the easternmost point of Prospect Hill in Somerville, that this bed is not horizontal, as it would naturally have been had the mass been laid down on a plain, but curves over the hill in a gradual arch, precisely as it should if the supposition of an internal ridge of rock be correct.

The interpretation of the record of the events of the glacial and post-glacial parts of the history of this region is difficult, and much doubt must necessarily exist for a long time as to what is the true reading. I cannot doubt, however, that we must acknowledge that very great changes in the face of the surface as it was left by the glacial sheet, have taken place. If the foregoing reasoning is correct, and there originally lay all along our shore a sheet of glacial detritus of which the ridges which we have been studying are only the wrecks, then we must be prepared to admit long continued erosion to produce such changes as have taken place. Nor will erosion, unattended by other agents of change, have produced the result; we must suppose that the present shore was at one time higher above the sea in this neighborhood than it is now. When the ridges which remain in the harbor were protected by their rock bases from erosion, they must have stood at a higher level above the sea than at present, for they are now without this protection at ordinary tide mark, and are all, except when artificially guarded, giving way before the action of the sea. The glacial period was evidently a time of great oscillations of level, and not the least of the difficulties which the geologist finds in studying its phenomena, is to determine the character of the changes in the level of the land. The formation of the more conspicuous features in the topography of the drift formations of eastern Massachusetts, would require something like the following succession of events.

1. The covering of the whole country with a glacial sheet, the ice having a slow movement towards the shore, the direction of move-

ment of the bottom, at least, varying a good deal with the surface of the country traversed. It is not necessary to assume that this movement extended to any very great distance inland, as it has not been proved that any boulders have been transported more than thirty or forty miles along the direction of the striæ. It is not possible to deny that detrital matter may have been brought from greater distances inland along this path, for the facts have not yet been carefully analyzed; but as yet I have been unable to find any masses bedded in the drift which could be referred to more remote points, while by far the greatest number are clearly traceable to rocks which are found in the immediate vicinity of the point of deposit.

2. The rending from the floor of the ice stream of large quantities of fragments which were ground to mud in the jam of materials at the base of the ice sheet, or lifted into the body of the mass by the irregular tumbling movements which must have occurred in the passage of the stream over the broken surface it traversed, followed by the melting of the glacial accumulation and the deposition of the mass of detritus it contained in the unstratified shape in which we now find its remains.

3. The action of the drainage streams and tidal currents on this incoherent mass, the former probably swollen for a time by the waters of the melting ice, cutting away the incoherent mass of drift. and clearing out the old channels in which they ran before the glacial period, leaving drift ridges capping the summits of the original, low, rock hills of the country.

4. During these actions, but at times which remain to be determined with exactness, certainly one, probably two movements of the surface took place, which have left only an imperfect record; the first and well proven, being a submergence of at least one hundred feet; for to that height on our hills of drift are superficial patches of stratified materials found. This movement probably occurred at the end of the ice time, and the change of shore did not last very long. The other movement was a depression also; if it really occurred, it happened at the close of the elevation which followed this first depression, in which the land seems to have risen a little higher than it is at present, the difference being probably not over twenty to forty feet. I regard this second depression as probable, but not proven.

The reader who is familiar with the disposition of the unstratified drift on our shores, will recognize the fact that the mass is much greater at some points than others. This is to be expected. If we examine

those regions which most closely resemble in their present condition the state in which this country was placed during the glacial period, we may find a ready explanation of this fact. In Greenland, for instance, although the glacial sheet covers the whole of the country at a few miles back from the shore, it only comes down to the coast in the valleys or fiords. It will be at once seen, as soon as the distribution of our drift is indicated on a good geological map, that the greatest accumulation of it is about the mouths of our larger river valleys. The accumulation, of which we find the remains in the drift hills of this neighborhood and the islands of the harbor, is the product of the stream which descended the Charles River valley. The immense drift deposits of Long Island, New York, are the product of the Housatonic, the Connecticut and the Thames glacial streams, possibly also of that more gigantic glacier which swept down the Hudson. It is evident that these local glaciers could have been in existence only during the later part of the drift period. There was an earlier time when the moving sheet swept over the whole shore line, as is proven by the fact that every exposed ledge on the shore or on the islands beyond it, is scored by the glacial movement. The terminal moraine during this time must have been far out to sea, and it is probably to this first stage of the glaciation of this country that we owe the formation of the broad submerged table land which borders the whole northern coast of the United States for a width of over one hundred miles. We owe to Professor Agassiz the recognition of the probable glacial origin of this set of banks and shoals.

If we extend our hasty survey beyond the New England shore to the northward, we find many facts which are reconcilable with the views here presented. The banks of Newfoundland are most likely the great terminal moraines of the vast glacier which discharged the snows of the greater part of the region drained by the St. Lawrence. They bear much the same relation to that valley which the eastern part of Long Island bears to the basins of the Connecticut and of the rivers to the eastward.

The most difficult question which the geologist has to deal with in connection with the drift beds, is that of the origin of Cape Cod. I do not propose to undertake at present the discussion of the history of this singular promontory. I will only venture the suggestion that the main body of the cape has very likely a low axis of elevation beneath it, connected in some way with those lines of disturbance

which are to be traced in the islands immediately to the southward, especially in Martha's Vineyard and Nantucket.

Dr. Thomas Waterman was chosen Curator of Mammals and Comparative Anatomy.

On motion of Dr. B. Joy Jeffries, the following amendments to the By-Laws of the Society were passed.

Section IX was altered so as to read Section X.

A new section was added, as follows:—

SECTION IX. OF SECTIONS

Article 1. Sections of the Society, holding separate meetings of their own, may be formed on the written application of ten members, by the consent of the members present at two consecutive meetings of the general Society.

Art. 2. The requirements of membership shall be:

1st. Membership in the general Society.

2d. Written nomination by two members at a regular meeting of the Section.

3d. Election by a three fourths vote of the members present at the subsequent meeting.

4th. Signature to the standing rules within six months from the date of election.

Art. 3. The records shall be entered in chronological order upon the book containing the records of the ordinary meetings of the Society.

Art. 4. Such notices of each meeting as shall be judged by the Publishing Committee suitable for publication in the Proceedings or Memoirs of the Society, shall be announced by the Secretary at the next regular meeting of the Society.

Art. 5. Sections shall have the exclusive right to make additional regulations for the perfecting of their organization, subject to the approval of the Council.

Messrs. C. J. Sprague and R. C. Greenleaf and Drs. Charles Ware, J. B. S. Jackson and James C. White were appointed a committee to nominate officers for the ensuing year.

Section of Entomology. January 26, 1870.

Mr. E. Burgess in the chair. Twelve persons present.

Mr. F. G. Sanborn exhibited a drawing of the larva of *Callosamia Promethea*, made by the late Mr. C. A. Shurtleff, together with the specimen after it had spun its cocoon; a memorandum written by Mr. Shurtleff on Sept. 17, 1860, read as follows:

A full grown larva was just beginning to spin its cocoon; on the eleventh segment there was a portion of the old skin which it had previous to the last moulting; the skin formed a perfect ring, and of course was very small for the full grown larva, the diameter of the ring on the eleventh being .25 in., while the tenth segment measured .37 in. in diameter.

There was a little piece of the old skin on the wart on the tail. The caterpillar appeared to be perfectly healthy and well formed, excepting that it could not use the last pair of prolegs very well in walking; it could, however, take hold with them to a certain extent. It spun a perfect cocoon, and tried to cast its skin, but after bursting the skin on the back, died before it could shed it.

Dr. H. Hagen read a criticism of the views of Dr. Packard concerning the Neuroptera, as given in his recently completed "Guide," and explained that, in the manuscript of his own "Synopsis of North American Neuroptera," he had, in accordance with the views of the most prominent Entomologists for twenty eight years, distinctly separated the Pseudoneuroptera and Neuroptera as two different parts of the work.

Dr. Hagen also remarked that Mr. Fritz Müller had sent to him some white ants from Itahahy, St. Catharina, Brazil, with the following remarks:—

These nests of white ants are more or less regular cylinders, one span high and two or three inches thick. By horizontal floors they are divided into twelve or fifteen compartments or chambers. The outer surface bulges out so that one can make out the number of

chambers by the enlargements of the cylinder. A pillar goes through all the compartments; close to this, or in it, runs an oblique passage from each chamber to the next. Sometimes all these passages together form a somewhat regular winding stair through all the compartments. For the impregnated female these passages are too narrow, and she can therefore not leave her chamber.

There are, both in the outer wall and in the horizontal divisions, passages too small to admit the passing of the winged ants; but neither in the outside wall nor in the chambers is there any opening to the outside in nests which have not been injured.

In the outside wall the passages run from top to bottom. In the divisions, from circumference to centre without reaching this latter. In the flat compartments they are not to be detected from the outside; in the circumference they appear as flattened ridges. In drying, the outer side of the passages falls off, and then they are to be seen as deep hollows with inflated borders. In undisturbed nests the only entrance seems to be on the upper surface some inches under ground.

The nest is not directly connected with the earth, but is surrounded by about a finger's breadth of free space. The nest can, therefore, as soon as the upper end is freed from earth, be easily taken out of the ground.

I have never found in one of these nests more than one impregnated female. Besides the winged ants, the eggs and the larvæ, there are found two kinds of laborers; of these one kind is distinguished by a truncated nose.

Not in the nest but in the same piece of land, are found, in planting corn, single white ants with disproportionately large heads and long mandibles.

The winged ants were stated by Dr. Hagen to belong to *Termes striatus*, or perhaps to *T. similis*; the imago is in too bad a condition for accurate determination. The soldier with truncated nose was figured by him as *T. similis*; the soldier with long mandibles, as *T. cingulatus*.

No description of white ants' nests like this has ever been given before.

Mr. S. H. Scudder remarked that in a recent examination of the external genital armature of our diurnal Lepidoptera, he had noticed the extraordinary fact that in the males of

the North American species of the genus *Nisoniades*, these organs were asymmetrical. The asymmetry is confined to the lower lateral plates, which are unusually developed in this genus, and shows itself in the diverse length of the lower process and in the size, and the entireness or the excision of the lateral flap. The only species in the genus, as generally accepted, which does not come under this rule, is *N. Catullus*; but the structural features of all the appendages of the body of this species show that it is wrongly placed in this relation.

Mr. Scudder also stated that the butterfly described by Dr. Harris in his State Report as *Eudamus Bathyllus*,—a name invariably accepted by subsequent writers—was not the species originally described and figured by Abbot and Smith under the same specific name; he therefore proposed to call Harris's species *Eudamus Pylades*.

Mr. P. S. Sprague referred to an instance related by a friend not versed in entomology, where "flies" were seen, through a hole in the ice in midwinter, to ascend in large numbers from the bottom of a stream to the surface and take flight.

Mr. B. P. Mann stated that he had taken a specimen of *Carabus Chamissonis* Fisch., in Labrador.

Mr. F. G. Sanborn remarked that he had taken ten or twelve specimens of the same species in August, on the sides of Mt. Washington, N. H., at a height of from four to five thousand feet above the sea.

He also reported the capture in Andover, Mass., on Christmas day, 1869, of *Capnia* and *Tæniopteryx*, moving actively upon the ice; of several *Staphylinidæ* of the genera *Lathrobium*, *Stenus*, *Philonthus* and *Lithocharis*, together with *Photinus corruscus* and larvæ of *Telephorus*, and some undetermined Coleopterous and Geometrideous larvæ, also a species of *Salda* (Hemipterous), and of *Diptera*, *Hydrophorus pirata* Loew, and *Sepsis sp.*, which were struggling in water of about one eighth inch in depth, covering the surface of the ice in meadows.

A great number of Arachnidæ, mostly of small size, were noticed under the same circumstances, and appeared to represent many species.

He was in pursuit of the aberrant forms, *Boreus* and *Chionea*, but several hours of careful search failed to reveal any specimens of either.

February 2, 1870.

Vice President Dr. C. T. Jackson in the chair. Thirty three persons present.

Dr. B. Joy Jeffries stated that, as at different times during the past three years he had had occasion to call the attention of the Society to the physiology of accommodation in man and other animals, including birds, he would ask to be allowed to make a few remarks on a special part of the eye which is interested in, and may be employed in, accommodation.

He illustrated his remarks by a series of pictures and diagrams representing sections of the human eye and of a number of different animals, made through the ciliary muscle and the adjacent parts of the sclerotic, cornea and iris. From dissections made by many anatomists, and the special studies of several physiologists, it resulted that the space in the eye hitherto known as the canal of Fontana, who first described it in 1778, is now proved not to be a canal with walls, but rather a triangular space between the ciliary muscle, iris, and sclerotic or cornea, filled by a sort of mesh work attaching the iris to the last named membrane. This mesh work is cut off from the aqueous humor. It constitutes the ligamentum pectinatum iridis, and is quite distinct from the circular venous sinus in the sclerotic just outside of it, which has apparently sometimes been mistaken for it. Dr. Jeffries discussed the question as to whether it took part in the accommodation of the eye, if not in man where it seemingly could not, in the lower animals where its size increases with the decrease of the ciliary muscle. He remarked that our present knowledge of it is due to the recent researches of Drs. Iwanoff and Rollett.

Mr. C. J. Sprague declined membership in the Nominating Committee, to which he was recently elected, and Mr. James M. Barnard was chosen in his place.

Section of Microscopy. February 9, 1870.

Dr. B. Joy Jeffries in the chair. Nine persons present.

The following paper was read: —

NOTES ON DIATOMACEÆ. BY PROF. ARTHUR MEAD EDWARDS.

I am one of those who have always strongly advocated the keeping of written and drawn notes by observers of nature. However crude and imperfect the drawings may be, however incomplete the written descriptions, yet, if made conscientiously and with due regard to facts, stating what the observer *thinks* he sees, they always possess the value of truth, and at the same time serve to place upon record and impress upon the mind many things that would otherwise pass unheeded, and those often of great value. So by following out such a plan, the mind of the student is drilled in system, the great secret of success in all scientific observations, as well as in other matters. For a long time I have kept a book in which, from day to day, and immediately as observations are made, memoranda are jotted down, often accompanied by sketches, colored or not, as the subject requires. And on looking back, I frequently find in my older notes the key to some puzzling phenomenon undergoing investigation at a later time. Let not the observer plead the excuse that he cannot draw; I believe that everybody can learn to draw sufficiently well to give a truthful, if not artistic representation of what appears before his eyes. Every one can write well enough to say what he sees when required, and drawing is but a short-hand system of writing.

I believe, also, that when a student of nature has recorded anything that he thinks will be of value or interest to others, he is in duty bound to make such observations public. To illustrate my belief thus expressed, I thus communicate some brief abstracts from my note book, and if they prove acceptable, will from time to time do the same again.

My notes are of observations made by means of the microscope, and the first is relative to one of those curious atomies of the vegetable kingdom, the Diatomaceæ. A few days since (Sept., 1869) I made a gathering in a ditch communicating with the salt water of the Hudson River, opposite the city of New York, at Weehawken, N. J. Of course the water in the ditch was salt; and, in fact, in it last spring I had caught specimens of Stickleback (*Gasterosteus*) which had come up there from the river to spawn, as is their wont to do. The Ten-spined Stickleback (*G. pungitius*) I had found very plentiful, and mixed with it a few individuals of the Three-spined (*G. aculeatus*); in fact these fish occurred in such numbers that when the water became foul, as it did by evaporation, the bottom of the ditch was literally covered with their dead bodies. The gathering, however, I have to speak of at the present time was made for the purpose of procuring Diatomaceæ, and consisted of specimens of an alga belonging to the genus *Enteromorpha*, having attached to it more or less firmly numerous Diatomaceæ and animals. The commonest form of Diatom was a *Cyclotella*, and seemingly fixed in some manner to the *Enteromorpha*, for it was not shaken off by pretty rough usage. How it was fixed I could not detect; most likely by means of a mucous envelope of such tenuity that it is not readily seen.

The next most common form is the truly wonderful, inexplicable *Bacillaria paradoxa*, the paradoxical bundle of sticks. Often and often have I spent hours looking at this marvel of nature; the motion without apparent cause or mode, an invisible joint which, as a friend of mine, an engineer, once remarked, would be a fortune to any one who would discover it, for here we have several sticks forming the bundle, moving over each other without separating, and yet the use of the highest powers of the microscope has failed to detect the means of their union into one mass or composite group of individuals. This grouping of individuals together, which we so commonly find among the Diatomaceæ, as in *Schizonema*, *Achnanthes*, *Melosira*, and a host of other genera, appears to me to have its analogue in the animal kingdom in the Polyzoa; which, although generally fixed, yet at certain periods throw off motile forms by means of which the species is distributed. Do not the Diatomaceæ do likewise? I am of opinion that they do, and I shall produce evidence on that point further on. As to the *Bacillaria paradoxa*, the oftener I watch it the more it puzzles me. Not long since I saw one specimen (of course I mean one bundle of individuals) slide out to its utmost limit across the field of

view, and then, becoming entangled with two others, which likewise were made up of many individuals, some eight or ten of its frustules (as the complete individuals are called) were twisted around almost off from the rest, so as to lie at right angles to them, and when the group containing the largest number of frustules receded to their former position, which they soon did, the eight or ten seeming by the act of twisting to lose their power of motion among themselves for the time being, were dragged along in a helpless condition, and twisted completely around one revolution, so as thereafter to fall back again into their places, when all went on as usual. That is to say, the regular motion of all the frustules over each other succeeded. Now what kind of a joint can it be that permits of such eccentric movement! As I have already said, I am more puzzled than ever.

For sometime back a discussion has been taking place in some of the European journals as to whether this plant be an inhabitant of fresh or brackish water. What I have observed points to the fact that it will live in either. I have collected it in brackish water at Hoboken, N. J.; my Weehawken collection was from a ditch connecting directly with the salt water of the Hudson River at its mouth, and some years since I gathered it in the sweet fresh water of the Fishkill creek, along with Desmids and other truly fresh water plants which, as far as we know, will not live in water containing any appreciable amount of salt, and then, also, in winter and under the ice, but nevertheless in an active condition. And I have taken my salt water Weehawken gathering and diluted it with several times its volume of fresh water, and yet it seems to flourish after many days, and the *Bacillaria* is apparently more active than when first procured. So, also, the other Diatoms which are present along with it evidently profit by the change, for they have increased rapidly and are in vigorous motion.

Along with the *Bacillaria* in the brackish water at Hoboken, I found numerous individuals of an *Amphora*, which I have known in this neighborhood for many years, and which I considered unnamed as yet. To it I have given the provisional name of *A. lanceolata*, on account of the form of its outline. This genus has always been considered an epiphytaceous one; that is to say, one which grows attached to other plants or submerged substances, yet this form was free and in active motion. In fact I think it was one of the most lively Diatoms I ever saw. So another smaller species of *Amphora* which is common near here, is always, as far as I have noticed, free. Here we have

species appearing both in the free and attached conditions, and this is even more strikingly illustrated in *Schizonema.*

Bacillaria paradoxa is usually set down as the most rapid in motion of the Diatomaceæ, its velocity being recorded by Smith, as he measured it, at over one two hundredth of an inch in a second. This is certainly pretty quick when we consider that the length of the frustule is only .0025 of an inch. But my experience has been that its velocity varies in every degree from that mentioned to perfect rest; at times some individuals will be in rapid movement, while others are motionless; and also I have remarked that from sunrise to noon seems to be the period during which, under ordinary conditions, the movement is most active, while during the afternoon it is very sluggish, and at night almost *nil.* This *Amphora*, as I saw it at the time mentioned, was moving even more rapidly than I ever saw a *Bacillaria* move, and that with a steady onward progression very different from that of most naviculiform diatoms.

It appears to me that in *Schizonema* and similar genera, which consist of siliceous loricated naviculiform frustules enclosed in membranous tubes, as soon as a rupture of the investing membrane takes place, by fracture or tearing asunder, almost immediately a knowledge of the fact is in some way communicated from the point at which the opening occurs to all other points of the tube, as at once the contained frustules which hitherto have been at perfect rest or, at most, only moving to a very slight extent, and even then in an extremely sluggish manner, become animated in their motion, and the most of them move towards, and attempt to escape from, the opening made. And this evidently does not result, as might at first have been supposed, from any pressure exerted upon them from the closed end of the tube, and which, therefore, only shows itself when the obstacle in the shape of the investing membrane is suddenly removed. For the motion is the true lively action peculiar to the living individual in the naviculiform Diatomaceæ, and is not in all cases towards the opening made, but often many, or, as in some cases which have come under my observation, most of the frustules begin to move in an opposite direction at first, while at the same time many escape by the opening in the tube, and thereafter assume vigorous motion in the surrounding liquid. Again, usually some of the frustules being, as at first appears, carried along by the stream constituting the mass of those moving towards the opening, all of a sudden seem to change their minds, or are struck with an idea, if I may so express myself,

and here and there will be seen individuals which at once alter the direction of their course and move in exactly the opposite direction, or backwards, as we may say. The individual frustules as they escape from the ruptured end of the investing tube and enter the surrounding water, do so with the peculiar trembling and apparently uncertain movement so characteristic of many of these organisms.

It will be well to note that these observations have been mainly made on *Schizonema Grevillei*, a species occurring very commonly in New York harbor, although I have noticed the same thing to happen with other species of the same genus, and, if I am not mistaken, in the allied one, *Homœocladia*.

After a time it would seem that the broken end of the tube becomes closed again; perhaps by the deposition of new matter, or it may possibly be by the action of the surrounding water upon the fluid within the tube, if it be of a different composition (which would seem to be extremely doubtful, however), as the frustules no longer attempt to escape and resume their quiescent state from which they have been startled by the accident of the rupture, or they move over each other up and down with the same irregularity which is commonly the habit of these forms.

I am strongly of opinion that certainly in some of the cases in which I have seen this escape of frustules take place from the investing tube, it has not resulted from any rupture caused by my manipulation, but would seem to be a normal occurrence. In fact, at such times the diatom is taking upon itself the active or free condition by means of which the species is to be distributed. And we must believe that such is the habit of all so-called epiphytaceous forms, otherwise it is not easy to comprehend how the species become so wide spread as many of them are, for we have not at present any authentic notice of the formation of free swimming spores in this family. It is hard when making such observations as those I have here recorded, to believe that these organisms are not endowed with sentient capacities, especially when one sees, as I have, a free frustule of such a *Schizonema* apparently perseveringly attempt to regain a lodgement within the tube from which it had some time before escaped, by means of repeated dives towards the hitherto open end, which has since become closed. I have observed such struggles continue for a minute or more, but never with the success apparently desired.

Many months since I mentioned at one of the meetings of the Lyceum of Natural History in New York, that I had seen two ap-

parently different genera of Diatoms existing within the same investing tube; and now I wish to place that fact upon record, and state one or two more instances of the same mode of growth. During the month of March, 1868, I found in the harbor of New York specimens of *Schizonema Grevillei* in active motion within their investing tubes, but accompanied by a much smaller form possessing a totally different outline from *S. Grevillei*, being blunter at the ends, and with parallel sides on S. V. During the same month, and also in April, I found this mode of occurrence very common, and also *Schizonema Grevillei* and a *Homœocladia* in the same tube, and *Schizonema cruciger* and the small form mentioned above, both in the same tube, and *S. cruciger* and *Grevillei* in the same tube. In all these cases the frustules were in lively motion, passing over each other from one end to the other of the tube. In May of the present year, 1869, I found growing in the salt water of the "Mill pond" at Salem, Mass., *Schizonema cruciger* and *Nitzschia closterium*, W. S. (*Ceratoneis closterium*, C. G. E., and *Nitzschiella closterium*, L. R.), both in the same tube. And here it will be necessary to say something in regard to the form I have called *Nitzschia closterium*, as I shall thereby, I hope, be enabled to clear away a little fog of synonyms. Neither Smith, Kützing nor Rabenhorst describes or figures any species living within a tube like *Schizonema*, the frustules of which have an outline and markings similar to *Nitzschia closterium*, so that it is not likely that they ever saw anything but the free form or condition of this species. However, Ehrenberg figures and describes, under the designation of *Schizonema ? Agardhii* (*Die Infusionsthierchen*, 1838, p. 343, T. XX, fig. XVI), a form agreeing with this, but the structure of the frustule is that of *Nitzschiella* of Rabenhorst, so that the specific name of this species should be *Agardhii*, whatever its genus be decided to be hereafter. For the present, as it is nearest allied to the forms grouped under *Homœocladia*, it had better be placed in that genus, so that the synonomy would stand thus.

Homœocladia Agardhii, C. G. E. (sp.). Abhand. K. Akad. Berlin. p. 311. 1833.

Ceratoneis closterium, C. G. E. 1840.

Nitzschia closterium, W. S. 1853.

Nitzschiella closterium, L. R. 1864.

What are we to say to such facts as these I record, as well as that of which I sent an account and illustrating specimens to the late Dr Walker-Arnott,—and which has been noticed by Mr. F. Kitton, who

examined my specimens, in Hardwicke's Science Gossip for May, 1869, Vol. v, p. 109,—of the occurrence of what are usually considered two distinct species of *Gomphonema*, viz., *G. capitatum* and *G. constrictum*, both growing upon the same stipes or stalk ! But this is not all. Since then I have made gatherings at the same place, and still find the above two forms growing upon the same stalk, and two others of totally different outline which appear also upon the same stipes. So that here we would have four hitherto considered distinct species arising from the same individual. I do not name the two last mentioned forms, as I am in some doubt with regard to the names that have been applied to them. The question of what is the individual in the Diatomaceæ is again raised by the observance of these facts, as well as those I described in my "Note on a point in the habits of the Diatomaceæ and Desmidiaceæ," read before the Boston Society of Natural History, January 8, 1868, and published in their Proceedings, Vol. XI, p. 361. The specimens illustrating the remarkable mode of occurrence of the two forms of *Gomphonema* which I sent to Dr. Arnott unfortunately did not arrive until after his death; but, speaking of my having so found them, he wrote to me in the last letter I received from him as follows. I feel that I am justified in publishing this extract as it is of such importance; and I also know, from what he wrote to me, that he himself would not object to my doing so were he still living.

"Your discovery of *Gomphonema constrictum* and *capitatum* growing on the same stalk is interesting, if you are not deceived. When a *Gomphonema* spore grows on a weed, the stalk (which is merely the external mucus collected at the one end) is formed by the growing frustule. It is not the stalk (or in *Schizonema*, the tube) which produces the frustule, but the frustule which produces the stalk or tube. Then when the frustule self-divides, several are formed, either side by side, or each may project a new stalk; but seldom with much regularity. Now every frustule and valve arising from the same spore *must be precisely alike*, being all formed from the original frustule by repeated self-division; and as self-division merely repeats the same identical form or variety, it is not easy to understand how it is possible to have two varieties of form on the same stipes. If there be no mistake on your part, you will overturn all the present views of the production of new frustules and valves. It is more easy to suppose that a frustule from another stipes had become agglutinated to the stipes. But as you say you have sent some in a bottle, I will examine

it with care when it arrives. Every spore may produce a different variety, but it is not easy to understand that the same spore, or stipes, can give rise to different varieties. As for the two species (*G. constrictum* and *capitatum*) I have never been satisfied that they are distinct, and probably *G. herculaneum* is another variety."

For my part, from the mode in which the two new valves are formed within and between the two old ones, when self-division takes place, I can readily understand how a great variation in both outline and sculpture can occur. In this case the two forms have exactly the same sculpture, and the difference between them merely lies in the outline of the valve. From my knowledge of how greatly this character varies in the Diatomaceæ, I, from an early period in my studies, considered these two supposed species to be but forms of one, and this discovery proves that my surmises were correct; at some future time I may have something to say with regard to the genus *Gomphonema*, and what, in my judgment, constitutes a species in it. I am now engaged, and have been for some years, working up several genera, with the express purpose of determining the true lines of specific distinction in them. And I must be permitted to here enter my earnest protest against the custom which has become so wofully common, in England more especially, of manufacturing species where they do not exist.

The labors of such self-supposed students of nature are more than thrown away. Our books become crowded with worthless synonyms, and this branch of biology has, in consequence, fallen into disrepute among scientific observers generally. If those who have the opportunity of securing and examining specimens of Diatomaceæ, would only study them a little more carefully, and if they must publish, do so only after properly maturing their knowledge, we might hope to learn something of the life history of these strange atomies. Better that really new species should forever remain unnamed, than that such contributions to the literature of the Diatomaceæ, as appear from time to time in foreign journals, should ever see the light. It is a curious fact that almost every one who becomes possessed of a microscope of sufficiently high magnifying power, at once imagines that he is abundantly armed and equipped, as well as qualified, to attack and overcome the most difficult problems in biology. Hence we find the most startling discoveries put forth by very immature observers of nature who suppose themselves to be students, but who have really given little time or thought to study. No branch of biology, perhaps,

has been more cursed with supposed discoverers of this class than the Diatomaceæ, until a man comes to be appreciated by the number of species he can manufacture. By far the largest number of observers who are attracted to these beautiful and wonderful atomies forget that we have in them presented to us for investigation one of the most puzzling problems in the whole group of phenomena, illustrating that which we call life, but on the contrary appear to consider them as "simple organisms," whose morphology and life history, as well as classification, are therefore proportionally easy of comprehension. I have devoted many years to the earnest study, under varying conditions, of these examples of complex simplicity, and pity it is that others who have not spent so much time over this branch of organic existence should not have been so fortunate as I was in possessing a wise and patient counsellor in the late Dr. Walker Arnott. I can truly say that had it not been for his invaluable friendly advice, I, too, would have doubtless ranged myself with the manufacturers of species and synonym accumulators. Often have the kindly words he has written me made me pause ere I, as he pithily remarked, "rushed into print" with supposed discoveries, which I would have been ashamed of thereafter. Dr. Arnott says "a microscopist looks on everything as subservient to the microscope, and that whatever he sees, and which appears distinct to the eye, he thinks ought to be described or figured as distinct. I am, on the other hand, a naturalist, a botanist in particular, and use the microscope, simple or compound, as a necessary evil, merely to enable my eyes to see better minute structures, but whether these differences amount to specific or generic importance, or are only peculiar forms of one species, is the result of analogy, a mental process which can only be attained by a training in botany in all its branches, for many years." Natural objects, like the Diatomaceæ, which can only be seen after they are magnified several thousand times, and then only under peculiar circumstances of illumination, must be difficult of comprehension, even if their life history were much more simple and more easily studied than it is. I cannot too strongly caution the intending student of this enticing branch against trusting to a few and hasty observations made upon the dead skeleton of the plant. It is only when they are studied in the living state that the Diatomaceæ can be understood, and even then only with difficulty.

But one more abstract from my note book and I must draw these remarks to a close. In the early part of November, 1868, I made a

collection of *Colletonema vulgare*, and for some time have been able to keep it alive in a bottle so as to study its peculiarities. And here let me say that many minute forms of both animal and vegetable life which I have been unable to rear otherwise, I have found to flourish in phials with small necks, or those with large ones, which have the aperture partly stopped with a loose cover of some kind. It would seem that the gases given off from the human body, and accumulating in dwelling rooms, in which I have kept specimens, are deleterious to these small forms, and the partial closing of the vessel prevents, to a great extent, their entrance. My specimens of *Colletonema* flourished finely and grew considerably. I have been thus enabled to watch them, as I may say, building their tubes; this species, consisting of naviculæform frustules enclosed and freely swimming about in tubes, after the manner of *Schizonema*. In fact there is nothing to separate these genera, except that the first inhabits fresh water, whilst the latter is an inhabitant of the sea, where it is to be found generally in profusion, covering larger algæ and rocks. The extension of the tube takes places after the following manner. As the frustules increase by the process of subdivision common to all of the Diatomaceæ, of course the two frustules thus formed occupy double the space of one, and as the cell division is continually going on, after a time the tube must become choked with individuals. At this period in their existence they appear to be extremely active, moving with increased rapidity up and down the tube as freely as their crowded condition will permit. Whether the end of the tube is never closed, or opens at certain seasons, I have been unable to determine; at all events it is now found to be open, and the frustules slip over each other until they reach this opening, and one or two will project outside as if prospecting, and will occasionally return within the general envelope. When a frustule thus projects from the open end of the tube, it never, as far as I have seen, rushes onward with the vigorous motion with which it moves within the envelope, but this is doubtless only so when the tube is being lengthened. It can be easily understood that if the species be disseminated by the distribution of perfect frustules, as seems to be most likely, that they must then escape from the tube after the manner I have recorded above as taking place in the allied genus, *Schizonema*. When one or two frustules have projected from the open end of the tube, they often immediately come to a rest just beyond the tube, or do so after moving over each other slowly outside of, but in a line with, the tube. While at rest there appears to form around

them a transparent mucous sheath, which, so that it may not fix them in their position, is kept in a tube form by the frustules again moving over each other, and thus, as it were, fashioning and smoothing the inside of the tube. This sheath becomes more and more dense, until it is plainly visible as forming an elongation of the tube, when the frustules again project from the end, and a new portion is added. I have in this way seen a tube grow across the field of the microscope, and the closely packed frustules extend themselves in single file, each just overlapping those in front and behind it. The membrane constituting the tube, although dense and strong, is somewhat elastic, but not very much so, for I have seen three or four frustules become wedged together by one attempting to pass backwards, whilst the others were moving forwards, and at such times the tube does not stretch to accommodate the crowding, but yet is often bent by the force of the moving frustules. In fact this force must be considerable, as is evidenced by the size of the obstacles, as grains of sand, which a small Diatom will move; and in *Colletonema* I have seen the tough tube membrane bent inwards so as almost to collapse by such a crowding as I have mentioned.

As I have mentioned Mr. Kitton's paper in Science Gossip, I must here take the opportunity of saying something in regard to that article, and I feel sure that he will not take amiss what I shall say when he understands the spirit in which it is written.

First, I wish it to be understood that the specimens and the letter accompanying them were sent to Dr. Arnott for his opinion; thereafter I intended to publish the facts treated of myself. However, as Mr. Kitton has made public his opinions on the specimens, I will now give mine; but the fact of its being a private letter of mine from which he quotes, and one never meant to be made public, must explain what I there say. He has considered the "queer form" to be a new *Fragillaria*, and has named it *crotonensis*. Evidently he does not agree with that portion of my letter which he quotes, when I say: "I am not in favor of naming forms after places or persons, but strongly incline to distinctive and descriptive names." If the form were a new species I should have named it myself; but Dr. Arnott at once said it was likely to be *Fragillaria capucina* var. γ, and such I see Mr. Roper points it out to be, in the July number of the same periodical.

As it may be of interest in connection with this point, I may say that in a previous specimen of the sediment from the Croton water

which I had sent him, Dr. Arnott informed me he had found the following species: *Cymatopleura elliptica*, *Navicula trinodis*, and *gibberula*, *Surirella craticula*, *Denticula obtusa*, *Epithemia zebrina*, *Cocconeis Thwaitesii*, *Achnanthes ventricosa*, *Cyclotella rotula* and *operculata*, *Orthosira orichalcea*, *Gomphonema tenellum*, and another intermediate between *dichotomum* and *intricatum*, most likely the latter.

February 16, 1870.

Vice President, Mr. T. T. Bouvé, in the chair. Forty persons present.

Capt. N. E. Atwood presented, on behalf of Capt. Gideon Bowley, a broken skull of a walrus taken from a depth of several fathoms in the Gulf of St. Lawrence. Capt. Atwood stated that tusks of this animal were found, not infrequently, on the beaches of the Magdalen Islands, and the living animals were reported by seafaring men to have been seen there one hundred years ago.

The Secretary communicated the following vote passed at a recent meeting of the Trustees of the Museum of Comparative Zoölogy.

Resolved, — That the money presented to the Museum of Comparative Zoölogy by the Boston Society of Natural History to found the "Humboldt Scholarship," be gratefully accepted under the conditions laid down by the vote of the Council of said Society, at a meeting held November 17, 1869; and that the Secretary be directed to return thanks for this liberal gift.

March 2, 1870.

Vice President, Dr. C. T. Jackson, in the chair. Thirty nine persons present.

The following papers were presented: —

Description of the Larva and Chrysalis of Papilio Rutulus Boisd., of California. By Samuel H. Scudder.

By the kindness of Mr. Henry Edwards of San Francisco, I have been favored with two specimens of the chrysalis of *Papilio Rutulus* Boisd., of California, and with a colored drawing of the full-grown caterpillar, made by Mr. R. H. Stretch; their resemblance to the early stages of our common *P. Turnus* gives them an additional interest to entomologists of the Eastern States, and I therefore publish the following descriptions from the material above mentioned.

Larva resembling perfectly in form and general appearance that of *P. Turnus*; the general tint of both head and body apple green, but the last two segments above, and the posterior third of the body at the sides, become gradually much paler; thoracic segments tinged above with purplish, the third segment with a dorso-lateral, transverse, double, circular spot, each portion formed of a minute yellow spot, encircled with black; also with a small, round, distant, subdorsal, yellowish spot; fourth segment with a small, square, dorso-lateral and a small, round, distant, subdorsal, dark blue spot; the suture between the fourth and fifth segments is bordered rather broadly around half of the upper portion of the body with a bicolored band, terminating squarely at the end; in front of the suture it is yellow, behind, blackish blue. The stigmata are marked with blue, and there is a subdorsal and lateral row of blue dots on the seventh to the tenth segments. Prolegs paler than the general hue of the body. Length, when contracted, 35.5 mill.

Chrysalis. The two specimens referred to differ greatly in size and color, the larger one having brownish grey and blackish fuscous, the smaller apple green and yellowish brown markings. There is a rather broad stigmatal band, commencing at the tip of the abdomen, and continuing forward along the hinder edge of the wings to the eye, of a blackish fuscous or yellowish brown color; spiracles of the color of the band; a very broad dorsal band of the same color, but paler in tint, and especially so, anterior to the mesonotal

tubercle, on the metanotum and the first abdominal segment, and quite obscured by pale on the terminal two or three segments; in the brighter specimen this band is edged faintly with white; space between these either dull white, clouded and streaked with yellowish fuscous or apple green, the abdominal segments with a few short, longitudinal, delicate, black dashes; abdominal tubercles black; wings either blackish fuscous, paler externally, the base of the veins streaked with black, and the tips of the nervules with a black dot; or apple green, the base of the veins marked with pale dull yellowish edged with black, the base of the nervules marked delicately with black, and the wartlets at tip of nervules pale dull yellowish; whole front of abdomen either dirty white, more or less obscured and streaked with fuscous and blackish next wing tips; or whitish, slightly tinged or dotted occasionally with green or black. Legs, antennæ and tongue blackish fuscous, or mingled green and yellowish brown, streaked slightly with black; palpal prominences brownish fuscous, the sides paler, or green, above and within yellowish brown; sides of pronotal tubercle wood brown, or yellowish brown. Compared with *P. Turnus*, the lateral shoulder tubercles are slightly more prominent, the excision between the palpal prominences a little deeper, and the mesonotal tubercle very much larger; the subdorsal abdominal tubercles are also slightly more developed, and there is, in addition, a lateral row of minute tubercles. Length 27.5 – 36 mill. Height 7.5 – 9 mill. Length of mesonotal tubercle 2 – 2.75 mill.; distance of tips of palpal prominences apart 4.5 – 5 mill.

On the Phosphate Beds of South Carolina.

By N. S. Shaler.

The following paper on the phosphate marls of the shore region of South Carolina, contains a partial account of the observations made upon this district by the author, while under the employ of the United States Coast Survey, and is published with the permission of the Superintendent of the Survey, Prof. Benj. Pierce of Cambridge. A portion of the conclusions have a certain commercial as well as scientific value, and it was deemed by the Superintendent desirable to place them before the public at the earliest opportunity. The remainder of the description of these beds will be found in the report of the work of the Coast Survey for 1870.

Physical Geography of the Phosphate Region.

The physical geography of the area occupied by the phosphate beds is so important, not only to a proper understanding of the history of their formation, but also to a right appreciation of their economic value, that it will be well to set it forth briefly before we consider the beds themselves.

The coast of the United States between the parallels of 25° and 35° north latitude, forms a shallow and very regular westward curve. The depth of this bight is about two hundred miles, and the width of the opening measured from Cape Hatteras its northernmost, to Cape Florida its southernmost point, is not far from six hundred miles.

The land which bounds this great indentation is quite level for a distance of some tens of miles from the shore, rarely rising more than seventy five feet above the tide level within this belt. The character of the shore along this great Bay of the Carolinas [1] varies very remarkably, considering the little variety of vertical relief found there. From Cape Hatteras southward for a distance of about two hundred miles, the shore is bordered by a peculiar series of low islands, disposed in the fashion of a barrier reef. Along this whole shore the sands which comprise the outer islands seem to be in constant movement, the gaps between the islands changing their positions from year to year. The observations of the Coast Survey have given very valuable data for the study of these peculiar reefs, but it is not necessary for us to examine their history. South of Cape Fear we pass beyond this system of barriers and come upon a section of shore which differs in no important regard from the usual type of low shore on which the sea is slowly gaining. This second section of the Bay of the Carolinas has a length of about one hundred miles, extending from Cape Fear to Cape Roman. The whole coast from Cape Hatteras to Cape Roman forms three great indentations. The northernmost of these, sometimes known as Raleigh Bay, is entirely formed by the narrow ridge of the sand reef which separates the ocean from the broad water of Pamlico Sound. Immediately on the south of Raleigh Bay lies Onslow Bay, which shows along the whole coast line the same structure which we find in Raleigh Bay, but somewhat less distinctly. South of the southern point of this Bay we find less and

[1] Not being able to find any name for this remarkable feature of our continent, I have ventured to give it this one, in order to avoid the difficulties arising from the want of designation.

less of this barrier reef, until, as before remarked, the coast returns to the ordinary type of a low wasting shore. Continuing southward beyond this monotonous coast we find, at about twenty miles north of Cape Roman, the beginning of a new type of coast. Instead of barrier reef, with a considerable expanse of open water between it and the shore, the coast begins to be penetrated with long tide water creeks which cut up the shore region in an irregular manner. From Cape Roman to Charleston this character becomes more and more pronounced. From Charleston southwards as far as the mouth of the St. Johns River, in Florida, a distance of nearly two hundred miles, the coast for a depth of from five to twenty miles is intersected by these arms of the sea to such an extent that at many points the islands form two or three successive tiers. These tide water channels are to be counted by thousands, and vary from a few feet wide to sounds like the Broad River at Port Royal, which has a width of two or three miles. The general appearance of such a shore is not unlike what is seen on the northern part of the coast of this Continent within the limits of what has been termed the fiord zone. The complication of outline along the Carolina and Georgia sea border quite equals any thing which can be found on the shore of Maine or Labrador. A careful comparison of the details of the topography of any region in the fiord zone with what we find on this southern coast will show some essential differences. The maps of the Coast Survey for the island region of Maine, if compared with those of the sea islands, show the features in question very clearly, and the reader is referred to them for the character of the topography of these areas, if he has not had an opportunity of studying it in the field. The most important of these differences is that the main channels of the fiord regions always run perpendicular to the shore, while in the sea islands the channels approximately parallel to the coast are more numerous than those which are perpendicular to it. It is evident that no such scouring as is brought about by glacial streams could have excavated the tortuous channels of the sea island region, for to have produced such water ways the ice currents would have had to move parallel to the shore; which is clearly impossible.

It is by no means easy to understand just how this peculiar complication of the shore has been produced, but there are some features in its structure which seem to throw a little light upon the question. Throughout the sea island region the attentive observer may see that the surface of the ground is disposed in long, wave-like

undulations, the summits of which are generally parallel to the shore. On the innermost of the islands the action of the weather has partly obliterated these reliefs, but over a large part of the territory they are still quite conspicuous.[1]

On St. Helena Island they are peculiarly distinct, for the valleys between the summits of the ridges, though they are only a few feet deep, are still depressed enough to convert their bases into swamps, so that the alternation of upland and morass in parallel lines characterizes a large part of the surface of this and the adjoining islands. It is clear, on even a casual inspection, that these reliefs are not the product of aërial erosion; their channels are rarely occupied by streams; indeed, one may travel for days among these islands without seeing any indication of subaërial erosion, except from tidal currents wearing away some low cliff. There can be no doubt that this contour of surface is due to submarine forces, and that the essential features of the topography of this region were impressed upon it before it came out of the sea. Something of this same character of surface may be found beneath the level of the ocean along this coast, though it is at no point so clearly traceable as on the surface of the islands. There can be little doubt that these ridges and furrows are due to the run of tidal currents along the shore. There seems to be a tendency in streams not bounded by resisting banks, such as the tidal streams which course along a shallow shore, to arrange the material they sweep over in long ridges. Such a stream does not always press equally upon its floor, but is apt to have a banded character, or to have a form which may be compared to several streams flowing side by side, and closely joined with each other. Just what this is owing to it is not easy to say, but it seems not altogether improbable that the peculiar alternate strips of hot and cold water noticed in the Gulf Stream by the officers of the Coast Survey, may be due to the same or a related cause. The action of currents of air upon incoherent vapor in the atmosphere forming the banded clouds called by sailors *mares' tails*, may possibly be due to the same tendency.

In order to understand just how the sea acted upon this surface as it began to be lifted above it, it must be noticed that although the tides at Cape Hatteras or Cape Florida are not more than two feet in

[1] I am much indebted to Capt. C. O. Boutelle, of the U. S. Coast Survey, for information on many points connected with the topography of this region, both subaërial and submarine, and especially for having called my attention to these parallel ridges on Hilton Head Island.

height, they steadily increase as we go nearer to the centre of the Bay, until at Fort Pulaski, at the mouth of the Savannah River, they are over seven feet in height. This heaping up of the tide in this bay may be entirely due to the usual action of converging shores upon the tidal wave which flows into the bay they form; though it does not seem as if the indentation was sufficiently deep to produce so great an effect.

If we go back to the time when this shore began to emerge from the sea, it will be seen that where the tide was of considerable height it would tend to sweep around the low islands formed by the upper part of the ridges before described, and to dig out the incoherent sands which formed the bottom of the troughs between them. As the shore gradually rose higher these water ways would be more defined; but if there was an extensive tide water surface left, the scouring action would be quite decided, and these channels might in time acquire considerable depth.

A careful reconnaissance of the shore between Capes Hatteras and Florida will show the observer that the Sea Island topography begins where the tide rises above about four feet, and becomes more and more marked as we go towards regions where the tide becomes higher and higher, or in other words, that in a general way the amount of complication of outline of the shore line is proportionate to the height of the tide.

Geological History of the South Carolina Coast Region.

The physical geography of this region affords the key to its geological history, or to that portion of it, at least, which has given it the character it has at present. But to understand the more remote history of this region we must go back to a time when the shore line was at least two hundred miles west of its present position. At the close of the Cretaceous era the shore of this southeastern border of the continent lay near to the base of the Alleghany Mountains. The uplifts at the close of the Eocene probably carried the shore line some distance to the eastward, but just how far it is not easy to say, as subsequent wearing action has destroyed a part of the record. The elevation which closed the Miocene seems to have been far greater than that which came at the end of the preceding period. It appears as if the shore line must have come at some points, especially on the southern part of South Carolina, nearly as far east as the present coast.

The last considerable change of level which this shore has experienced came at the close of the Pliocene era. It seems likely that this uplift carried the shore line much to the eastward of its present position. The whole of the sea island belt is being worn away by the ocean at a quite rapid rate. The scouring action of the powerful tidal currents which flow through the fiords between the islands, tears away a great deal of the materials over which they sweep. Along the whole sea island belt from Winyah Bay, just north of Cape Roman, to the mouth of the St. John River, in Florida, this erosive action has resulted in the production of a broad, slightly submerged table land, having an average width of about eight miles, and an average submergence of about three fathoms. This table of sands is very well shown on the sailing chart of the U. S. Coast Survey, sheet 3d. The outer part of this bank probably marks the position of the shore at the close of the last uplift; that which created the sea island region. We shall soon see reasons for supposing that this must have been an exceedingly recent occurrence in the geological sense of that word. Wherever one of the great tide water streams, such as the Edisto, the Coosa or the Broad River, debouches into the sea, the coast chart shows that the sands swept out by it have built a delta which reaches beyond the table sands, and some distance out into the deeper water beyond.

It is very probable that the coast line was once much further out to sea than the border of this three fathom deep shoal would indicate. If the reader will attentively notice the way in which the Gulf Stream runs after it leaves the straits of Florida, he will perceive that it is thrown with great violence against a part of the coast of the Bay of the Carolinas. Its current, with a velocity of two to four miles per hour, strikes against the bottom of the sea in 31°, where the water has a depth of only one hundred fathoms. From this point nearly to Cape Hatteras, or for most of the length of the Bay of the Carolinas, this stream probably touches the bottom on its inside border.

There can be no doubt that this stream must exercise a certain wearing action against this part of the slope of the continent. A river having the velocity of the Gulf Stream at this point, or a tidal current, such as may be observed in our harbors, is capable of taking up and removing considerable quantities of detritus. Whatever erosive force the Gulf Stream may have at present, there is a great probability that in the immediate geological past its action on this

shore must have been quite powerful. It has been clearly shown by Professor Agassiz that the Florida coral reefs are but the last stages in the building of that great natural breakwater, and that the whole peninsula is probably the product of the work of the existing species of polyps and acalephs, working during the last geological period. If this be so, then it follows that before the erection of the Florida mole the Gulf Stream must have swept against the shore of the Carolinas in a more direct way than it does at present. The removal of the southern half of Florida would certainly increase the violence with which the stream presses against the Carolina shore. There is, furthermore, no doubt that the region swept by the inner edge of the Gulf Stream is composed of materials calculated to wear very rapidly when submitted to the action of a current of water. Although these considerations are not calculated to give us any decided assurance concerning the part which the Gulf Stream has played in the erosion of this shore, they still make it probable that it has had no unimportant share in the shaping of the coast.

It may be remarked, in passing, that there seems to be no clear evidence of recent subsidence on this coast. I am satisfied that the many facts which seem to indicate such action, and which have even deceived the remarkably acute Sir Charles Lyell, are really to be attributed to a variety of minor accidents, such as the undermining of the coast by the action of the waves, or to the rotting away of a considerable thickness of vegetable matter beneath the surface of the ground. This view of the meaning of these supposed evidences of subsidence is ably defended by Professor Tuomey in his report on the Geology of South Carolina.[1]

The Geology of the Phosphate Beds.

The effort to identify accurately the formations of North America with those of Europe has led in some cases to the hasty use of the names which have been applied to certain beds in the European sections, to designate American rocks.

In the nomenclature of the South Carolina beds, we have what

[1] Dr. Ravenel thinks that he has recognized the phosphate beds at the depth of about sixty feet below the surface, at Charleston. If this should be verified, we would be compelled, as will be seen hereafter, to suppose that after the formation of the phosphate bed under atmospheric agencies, the shore had been depressed to the depth of at least sixty feet below its present position. It would be difficult to account for such a great subsidence at this point, while beds at a distance of nine miles to the westward have not changed their position.

seems to be an instance of this confusion of names. In the largest work which has yet been published on the geology of this region, the "Report on the Geology of South Carolina, by Mr. Tuomey," the tertiary rocks of the State are divided into Eocene, Miocene and Pliocene, to suit the then newly proposed classification of Sir Charles Lyell. The Eocene tertiary is described as occurring in two different regions in two widely varying conditions. In the western part of the State the section shows, first, beds of sandstone and grit; second, beds of sand, gravel, and colored clays; third, siliceous clay; fourth, silicified shells; fifth, beds of sand and iron ore. In the shore region a great thickness of tolerably uniform marls is assumed as the equivalent of this varied formation, the apparently not unreasonable view of Mr. Tuomey being, that the difference in the position of these two regions relative to the shore, has caused the difference in the physical character of the beds. The organic contents of the supposed identical beds in the east and west regions of the State, are as varied as are their physical features. The fossils of the buhr-stone or western beds, named in the list of Tuomey, are almost all Gasteropods and Lamellibranchiates. The general character of these shells may be accepted as rather more like the Eocene of Europe than any other member of the tertiary series there, but their horizon has been determined, not by the comparison of the resemblances of the species, but by the fact that all the species found in this association are extinct. But although there is no apparent reason to question the position assigned to the buhr-stone formation, there must be doubt concerning the position of the beds of the shore region, which are placed as contemporaneous with it. We have in the Santee beds an assemblage of fossils very different from those occurring in the buhr-stone, and containing species such as the Zeuglodon cetoides, differing widely from anything found in the latter formation.

Still further to the east we have again in the marls of the Ashley and Cooper Rivers other physical conditions, and an assemblage of fossils which it is difficult to believe could have been deposited in the same geological period as buhr-stone fossils. Nor can we suppose that the one series of rocks was deposited far inland, and the other near shore, for in the Ashley beds, as remarked by Mr. Tuomey, the character of the fossils shows clearly that they could not have been deposited far from the sea border.

There does not seem the same reason for questioning the identity of the Santee beds, and those found along the borders of the Ashley

and the Cooper Rivers, that there is to doubt the identity of the age of the latter beds and the buhr-stone. The identity of the first named beds does not seem to be sufficiently proven; the contemporaneous origin of the last named is at first sight so improbable that it cannot be accepted without direct proof, which has not been presented. The level character of a large part of the surface over which these beds in question extend, makes it extremely difficult to trace by natural sections the relations of these several series of rocks. The palæontological evidence not being clear, the matter must remain in some doubt until we have artificial sections which artesian wells, tapping the abundant subterranean waters of this region, will doubtless soon give.

Overlying the Santee beds and the beds of the Ashley and Cooper Rivers, there are found at various points marls which are probably to be regarded as of a Pliocene age. This is the age assigned to them by Mr. Tuomey, and if we must make a division of the tertiary section, assigning a part to each of these three names, Eocene, Miocene, and Pliocene, there seems no reason to protest against the term. The extent of country covered by these beds is so small, and their disposition so irregular, that it seems necessary to suppose that a great amount of erosion has acted upon the surface, and that only patches of the formation as it once existed, have remained to the present day. These beds are of great value to us, however, merely as evidence of long continued exposure of the low lands of this part of the Atlantic shore.

The bed of phosphate of lime which we have been preparing to study, lies immediately on top of the "marls of the Ashley and Cooper Rivers," as they have been generally termed, though these beds are not limited to the basins of these streams. The whole of the workable material lies in a single bed, from six inches to three feet in thickness. Although it varies in its chemical and fossil components, it retains everywhere certain marked features. It is always more or less nodular; the nodules vary much in size, some being no larger than a pea, some a foot or more in diameter. These nodules contain, generally, one or more fragments of shells or corals, apparently all Eocene species, which seem to have been the aggregating points of the matter contained in the nodule. So far as my knowledge goes, there have been few, if any, nodules found containing traces of vertebrate remains. Many of the nodules show traces of wearing, not exactly what would be expected from their being rolled as by a

stream, but the style of wear which comes from being stamped and trodden on. The appearance of the worn surfaces reminds me of that seen on fragments of bone from Big Bone Lick, which have been ground by the trampling of the large pachyderms and ruminants which frequented that swamp. Sometimes these nodules do not make up more than a considerable fraction of the bed, the remainder being sand, pebbles, or the marl of the character found on the bed beneath. Again, the nodules are so crowded in the bed that they are soldered together into one mass, with scarce any interspaces between the separate concretions.

Mingled with the concretions there is found a very variable quantity of fossil vertebrate remains; by far the greater part of these consist of exceedingly worn fragments of cetacean bones and sharks' teeth and vertebræ, both clearly of the same species as those found lower down in the marls in the same section. Mingled with these, but comparatively rarely found, are the bones of a fossil horse, pig, mastodon, and bones and utensils of man. These last named fossils are almost always in a state of preservation, widely different from that of the remains of the cetaceans and selachians with which they are mingled. Their appearance indicates a comparatively recent inhumation.

Chemical analysis shows us that the nodules of this deposit contain the greatest quantity of phosphate of lime, the quantity varying at different points from forty to nearly seventy per cent. The first and most natural seeming explanation of the large amount of this salt, is that it is derived from the bones and excrements of the animals whose remains are found in the bed. But the points where the most bones are found are not those where the phosphate deposit is thickest or richest. At Chisholm's Island, on the waters of St. Helena Sound, where the bed has the greatest development yet discovered, and where the analysis shows more phosphoric acid than at some of the localities the richest in bones, the remains of vertebrate animals are very rarely found. It is not too much to say that at this locality not one part in ten thousand of the mass is composed of vertebrate remains. Nor can we assume that the mass of phosphoric acid has been furnished by the decay of bones which have been utterly broken down; in that case we should have the remaining bones showing all degrees of preservation. This, however, is not the case; the fragments, though usually much worn, retain their structure very well. Although I went upon the ground with a disposition to regard the

beds as the result of the decay of vertebrate remains, the general character of the deposit soon compelled me to seek some other explanation of its origin.

It has been suggested by a distinguished chemist that the deposit was the result of the submergence of a great guano area, during which submergence the bones of marine animals became mingled with the mass. There are several objections to this view: in the first place, no remains of birds have been found in the deposit, though fossils quite as likely to be destroyed, are well preserved there. Then it is difficult to see how in the immediate past this swampy shore could have been the breeding place of the quantities of birds which would have been required to have accumulated these phosphates, nor could we suppose that the climate of this shore could have been at the time of the deposition of the phosphates so different from what it is at present, as would have been required to produce the dry conditions essential to the accumulation of a guano deposit.

There is another view of the origin of these phosphate beds, which, so far as my knowledge goes, has not yet been suggested, and which, it seems to me, solves a part of the difficulties.

The phosphate layer rests upon a mass of marl containing a number of fossils which are found in a worn condition mingled with the phosphate nodules. The analyses of Dr. St. Julien Ravenel have shown that at several points beneath the phosphate beds the marl contains several per cent. of phosphate of lime, and it may be assumed as eminently probable that the whole of the marl beneath the region where the phosphate beds occur, contains a certain quantity of this material, mingled with the carbonate of lime which constitutes the mass. Now it is a well known fact that water containing carbonic acid gas in solution has a solvent action upon both these salts of lime, but that its power is greatest on the carbonate of lime. So that a mass of marl containing both these materials, submitted to the action of water charged with carbonic acid, might have the carbonate of lime entirely removed, and the mass left behind when the solving action ceased, might consist almost altogether of the phosphate of lime.

If we look a moment at the conditions which prevail in the phosphate region, we shall see that with this view we can easily frame an explanation of the formation of this phosphate layer. The usual section through these beds gives us on top a layer of vegetable matter

and soil containing humus, through which the water percolating becomes charged with carbonic acid; then the phosphate layer; immediately beneath that the marl containing phosphates, which is only slightly permeable to water. Soaking over this marl the water becomes charged with carbonate of lime and some phosphate which it carries away in the drainage system of the country. This process, going on for centuries, gradually dissolves away a great thickness of the marl, and gives, as in the capping bed, an accumulation made up of fossils from the wasted beds, which resisted decay, and could not be washed away; of phosphates which became aggregated into nodules; of remains of man and other recent animals, which, falling in the swamp, sank through the soft bog and became trampled in among the nodules by the living animals which inhabited this low land.

Great freshets might lay down several feet of clay and sand, or some rearranged marl on top of the phosphate layer, thus confusing the record, by making the remains of man and extinct animals associated with his early history in this region, seem a part of the ancient marl beds.

Looking upon the phosphate layer as the debris of a large amount of eroded marl, it is no longer a difficult matter to account for the association of fossils found there, which would be inexplicable without some theory of this kind.

Although this view of the derivation of the phosphate beds capping the Ashley River marls seems to clear away a part of the doubt which hides their origin, it discloses another question which is about as difficult to settle. If we are to derive the phosphates from the marl, in what manner are we to account for the presence of this material in the latter beds? I cannot say that I feel any great satisfaction in the explanation which I am about to offer, which after all is only half an explanation; but inasmuch as it promises to cast some light on what is a rather dark subject, I venture to present it.

It may be premised that the whole question of the formation of phosphates is one of the little understood provinces of geological inquiry. The usual supposition of the vertebrate origin of these accumulations does not fit some of the most conspicuous examples, and the ingenious hypothesis of the able chemist and geologist, Mr. T. Sterry Hunt, which accounts for the origin of the massive apatite beds of the early palæozoic by the action of quantities of unarticulated Brachiopods, separating phosphate of lime from the water of the sea, though doubtless a true cause, is not competent to explain many cases

of the occurrence of materials containing phosphoric acid in some of its combinations.

The tolerably uniform dissemination of phosphate of lime through the marl beneath the phosphates cannot be explained on any theory of the formation of such deposits that has come under my observation. The general character of the marl underlying the phosphates is quite different from what would be supposed from the fact that it contains numerous vertebrate remains. It does not seem to have been a deposit formed near the shore, but rather to have been the product of those agents of deposition which work in the deeper parts of the sea. It was my good fortune to see some of the material brought up from the floor of the Gulf Stream between Florida and Cuba, from a depth of nearly two hundred fathoms; the resemblance of the general character of this material to the marls beneath the phosphate bed is quite striking. It is by no means improbable that at the time when these beds beneath the phosphate bed were being accumulated, the Gulf Stream flowed over them. The peninsula of Florida did not then exist, and the natural path of the stream must have been just over the region of the Ashley River beds.

The material brought up by the Coast Survey dredging work under the direction of Count Pourtales, consisting, as has just been stated, of a marly substance, resembling in a general way the marls of the Ashley and Cooper Rivers, has recently been subjected to analysis, and strange to relate, it, too, contains a considerable amount of phosphoric acid. The analyses are not yet complete, but will in due time be made public by the officer having these dredgings in charge; but enough is known to make it sure that the chemical character of the material now accumulating on the bottom of the Gulf Stream, is likely to show a surprising likeness to that which was laid down on the sea floor where the Ashley and Cooper Rivers' beds were formed.

It is not the least singular part of the likeness of the materials on the Gulf Stream floor to the beds beneath the phosphates, that there, too, vertebrate remains abound. The dredge of Count Pourtales brought up from the bottom of the stream a considerable number of fragments of the bones of the dugong, or some allied animal. It might at first sight seem as if the occurrence of these bones afforded a sufficient explanation of the presence of phosphoric acid in the material composing the floor of the Gulf Stream, but here, as on the Ashley and Cooper River marls, it would be necessary to suppose

that a large part of the sediment falling on that floor (probably at least one third of the mass) was the product of vertebrate animals. This is clearly by no means a probable supposition.

We know that some of the pteropod mollusks, forms which are frequently abundant in the ocean at great distances from the land, have a composition not materially different from that of bones. It has even been stated, though I do not yet know by what authority, that some of the marine algæ contain a large per cent. of phosphate of lime. The fact of the existence of this material in a number of the inferior organizations of the sea makes it, in most cases, more reasonable to account for the formation of extensive masses of phosphate beds by the deposition of the remains of invertebrate species, than to suppose that they were accumulated by vertebrate animals.

If the foregoing view of the process by which the phosphate beds of South Carolina were formed be correct, then we may draw the important conclusion, important at least in an economic point of view, that wherever the phosphate-containing marls of the South Atlantic sea board lie in a position similar to that which they occupy in the vicinity of Charleston, the bed of nodular phosphate is likely to be found. The United States Coast Survey is about undertaking a careful examination of the region where it is likely that these beds may be found. So that this important source of wealth, not only to the States where it occurs, but to the whole country, may not want for that aid in its development which it may reasonably be expected the government should give.

There can be no doubt that the area of the nodular phosphates is much underestimated, though how great a part of the region where they occur contains the material in workable quantities, may remain a questionable matter.

It seems likely that the peculiar advantages of these beds will enable them for a long time to control the market for phosphates, at least in this country. They are over great areas, scarcely covered by the soil, so that the labor of excavating is small. The beds are, in most cases, remarkably accessible, on account of the peculiar system of lagoons which intersect the coast. Furthermore, the supply lies in a region which, more than any other in the world, is likely to require a large amount of fertilizing material of this character, to balance the waste brought about by the exportation of raw agricultural products.

NOTE. — It is a pleasure to me to acknowledge my obligation to Dr. St. Julien Ravenel for the great assistance kindly rendered by him during my examination of the South Carolina beds; he, having been the first to see the commercial value of these beds and a constant student of their features since their discovery, is now the person best acquainted with their phenomena. I account it a very fortunate thing that I had his guidance over a considerable part of the region I traversed.

Section of Microscopy. March 9, 1870.

Dr. B. Joy Jeffries in the chair. Nine persons present.

Mr. George Mixter was elected a member.

Mr. C. Stodder exhibited a new objective of unique construction, made by Tolles. With its draw tube closed, it was a 3-inch; when fully drawn out, a 4-inch; it had a working distance of only $1\frac{3}{4}$ inches.

He also remarked that Professor Eulenstein had written him that Nobert and himself had resolved the seventeenth band of Nobert's test-plate with a $\frac{1}{6}$ inch objective made by Tolles; they had been unable to do so with any other objective.

March 16, 1870.

Mr. William T. Brigham in the chair. Fourteen persons present.

The following papers were presented:—

Note on the Occurrence of Euleptorhamphus longirostris on the Coast of Massachusetts. By F. W. Putnam.

Dr. Günther, in his valuable "Catalogue of the Fishes of the British Museum," admits five distinct forms under the genus Hemirhamphus, which had been considered as genera by other authors.

While fully agreeing with Dr. Günther that the teeth are too rudimentary in this sub-family to warrant the establishment of genera based on them alone, yet the characters afforded by the head, body and fins, appear to be sufficient to establish these groups as genera. At all events there seems to me no reason to question the generic rank of the group now under consideration; for their elongated, slender and narrowed bodies, long pectorals, short ventrals and elongated heads, give them an appearance nearly as marked from the typical *Hemirhamphus Brasiliensis* as is *Exocœtus*.

Prof. Valenciennes has described two species of *Hemirhamphus* with very long under jaws, long bodies and long pectorals. One of these was figured by Russell, and afterwards, from a specimen received from the Bay of Bengal, by Valenciennes, in the "Illustrated Edition of the Règne Animal," under the name of *H. longirostris*, as at that time it was the only species known having an exceedingly long jaw. In the "Histoire Naturelle des Poissons," a second species, obtained at De Peyster's Islands (South Pacific), with a still longer under jaw, is figured and described under the name of *H. macrorhynchus*.

In 1859 Prof. Gill founded the genus *Euleptorhamphus* for a species of *Hemirhamphinæ*, with tricuspidate teeth in the lower jaw. He compares the specimen (the locality unknown) which he names *E. Brevoortii*, with *H. macrorhynchus* and *H. longirostris*, to which he acknowledges it to be very closely allied; but as the character of the teeth in his specimen differed from that given as existing in the two allied species, he felt warranted in considering his fish not only as a distinct species, but also as the type of a new genus.

In September, 1869, Francis Gardner, Esq., of Boston, presented to the Peabody Academy of Science a fish caught a few days previously by Mr. Augustus Welcome, a fisherman at Nantucket, while fishing with a number of others off the Island. None of the fishermen on the Island had ever seen such a fish before, and it was given to Mr. Gardner on condition that a name and some account of it should be sent to Mr. Welcome. At the first examination I felt sure that this specimen was either *H. longirostris* Val., or a closely allied species. And on looking over the collection in the Academy, I was still further surprised to find two specimens of a closely allied species; one from Cayenne, Guiana, presented several years since to the Essex Institute by Capt. J. Cheever, and the other without a

label. These two specimens I now refer with but slight hesitation to *H. macrorhynchus* of Valenciennes.

A fourth specimen of the genus was discovered in the collection of the Boston Society of Natural History, but unfortunately was without a label indicating its locality. This specimen is unquestionably the same species as the one from Nantucket.

I have also hastily examined three specimens contained in the Museum of Comparative Zoölogy, which were collected by Mr. Andrew Garrett at Hawaii, and am satisfied, as well as one can be without direct comparison of the specimens, that they are of the same species with the other specimens I have considered as *H. longirostris.*

The tricuspid teeth noticed by Prof. Gill in his *E. Brevoortii* do not seem to be of much importance, as one of the three specimens from Hawaii, in the Museum of Comparative Zoölogy, has tricuspid teeth in the under jaw, while the other specimens, which do not otherwise differ from it, have simple conical teeth. The specimen from the Boston Society is specially interesting as exhibiting the back teeth of the under jaw with three points, while the front teeth are simple. I must remark, however, that I have not been able to detect tricuspid teeth in the two specimens I have considered as *H. macrorhynchus*, though as I have not found them in three of the specimens that I have identified as *H. longirostris*, this character cannot be considered as even of specific importance.

The following summary of characters exhibits those common to the two species, and shows how closely allied they are. The specimens are all nearly of the size of those figured by Valenciennes; the Nantucket specimen being a little smaller than his figure of *H. longirostris*, while the Cayenne and two of the Hawaiian specimens are a little longer than his *H. macrorhynchus.*

EULEPTORHAMPHUS Gill.

Proceedings of the Academy of Natural Sciences of Philadelphia, 1860 (1859), p. 156; 1863, p. 273.

Summary of characters common to the two supposed species.

Body long, narrow and compressed. Head as is *Hemirhamphus*, but not so pointed. Length of head from tip of upper jaw to margin of operculum about one seventh of the length from tip of upper jaw to the base of the caudal. Upper jaw about as long as wide. Under jaw very long, about one fourth to one third of the total length of

the fish. Eye large; diameter equal to between one quarter and one third the length of the head from tip of upper jaw to opercular edge; equal to, or a little more than the interorbital space; less than the post-orbital portion. Caudal fin forked; lower lobe longest. Pectorals very long, about one fourth the length of the fish, under jaw excluded. Ventrals very small, about one sixth the length of the pectorals, and placed nearer to the base of the caudal than to the head. Dorsal and anal long, with high anterior rays; placed opposite each other, but the dorsal commences a few rays in advance of the anal.[1] Abdomen and sides silvery; above darker. Scales large, wide and short. Pectoral, I, 7 = 8; ventral, I, 5 = 6; dorsal, I, ii, 19 or 20 = 22 or 23; anal, I, ii, 18, or II, ii, 17, or II, ii, 19 = 21 to 23; caudal, III, i, 7+7, i, III = 22.

Euleptorhamphus longirostris.

——— ——— Russell,[2] Fish Corom., II, p. 62, pl. 178.

Hemirhamphus longirostris Val., Règne An., Ill. ed., pl. 98; Val., Hist. Nat. Poiss., XIX, p. 52; Günther, Cat. Fish., VI, p. 276.

Euleptorhamphus Brevoortii Gill, Proc. Philad. Ac. Nat. Sci., 1860 (1859), p. 156.

Pondicherry (Bay of Bengal), Valenciennes; Kawaihæ, Hawaii, Mus. Comp. Zoöl., No. 671 (3 specimens); off the Island of Nantucket, Mass., Peabody Ac. Sci., No. 250; unknown, Gill; unknown, Boston Soc. Nat. Hist., No. 277.

Depth of body, between dorsal and anal fins, is contained from eleven and one half to thirteen times in the distance from operculum to base of caudal. Dorsal 22 or 23; anal 20 to 22.

Euleptorhamphus macrorhynchus.

Hemirhamphus macrorhynchus Val., Hist. Nat. Poiss., XIX, p. 55, pl. 556; Günther, Cat. Fish., VI, p. 276.

De Peyster's Isls. (South Pacific), Valenciennes; Cayenne, Guiana, S. A., Peabody Ac. Sci., No. 251; unknown, Peabody Ac. Sci., No. 252.

Depth of body, between dorsal and anal fins, is contained from nine to nine and three quarters' times in the distance from operculum to

[1] In Valenciennes' figure of *H. longirostris*, the dorsal is represented as commencing directly opposite the anal, but in all the specimens I have seen, and in the one described by Gill, the dorsal commences a few rays in advance of the anal, as represented in Valenciennes' figure of *H. macrorhynchus*.

[2] I have not been able to refer to Russell's work.

base of caudal. Dorsal 22 or 23; anal 21 to 23. Eye very slightly smaller, under jaw slightly larger and fin rays slightly thicker than in *E. longirostris*.

From the above summary of characters it will be noticed that the only prominent ones by which the two species can be separated, are the deeper body and slightly larger fin rays of *E. macrorhynchus*, and these may prove to be only of sexual and not of specific importance. When a larger number of specimens have been examined, these differences may prove to be simply individual variations.

Note. Since communicating the above to the Society, the invaluable "Zoölogical Record" of Dr. Günther, for 1868 (just received in this country), has called my attention to the "Repertorio Fisico-Natural de la Isla de Cuba," by Prof. Poey, in which, p. 383, he describes as new *Euleptorhamphus velox*, from Cuba.

Prof. Poey compares his species with the figure and description of Valenciennes' *Hem. longirostris*, with which he states it to be very closely allied. He gives depth of body as contained ten and one third times in the length, and the diameter of the eye three and one half times in the head. Dorsal 19; anal 21. Teeth tricuspid.

These points, from the description of Poey, indicate his specimens to be intermediate between what I have considered above as *E. longirostris* and *E. macrorhynchus*, and strengthen my belief that there is only *one* known species of the genus.—F. W. P., March 18th.

Revision of the Classification of the Mollusca of Massachusetts. By W. H. Dall, Smithsonian Institution.

The classification here presented is not original with the writer, but simply contains the results of special students in all branches of malacology, published during the last ten years, and systematically arranged in this list. Such a rectification has long been demanded, especially by those students who are removed from large libraries, and who have hitherto been obliged to rely upon the systems of the older authors, which, in the rapid advance of science, are becoming obsolete. For economy in space and convenience to the student, reference has been made to the pages of the new edition of Gould's Invertebrata of Massachusetts, in which the various species here referred to the several genera, are described at length. No attempt has been made to rectify the specific synonymy, except in a very few instances, where it seemed to be urgently required. Doubt as to the value of a genus, or the proper reference of a species to it, or to the

nomenclature of the species, is indicated by an interrogation point. The sources from which the new arrangement has been principally compiled are the works of Troschel, Von Martes, Morse, Gray, Adams and others, as arranged in the classification of the families of the Mollusca, provisionally adopted by the Smithsonian Institution; for the use of which I am indebted to Prof. Theodore Gill. The authorities given for the larger groups are usually those who have restricted them as at present understood, and not the original authors of the names in a wider sense. The writer is aware that many modifications may be required as science progresses, but he hopes that even in its present and probably imperfect state, the adoption of the present more natural arrangement will be of value to students of malacology.

SUB-KINGDOM MOLLUSCA Cuv.

Class CEPHALOPODA.

Order Dibranchiata Owen.

Suborder Decapoda.

LOLIGINIDÆ H. & A. Ad.

Loligo Lam.

L. punctata, p. 513. L. Pealii, p. 514.

CRANCHIIDÆ Stp.

Taonus Steenstrup.

T. pavo, p. 509.

ONYCHOTEUTHIDÆ H. & A. Ad.

Ommastrephes D'Orb.

O. sagittatus? p. 510. O. Bartrami, p. 512.

SPIRULIDÆ H. & A. Ad.

Spirula Lam.

S. fragilis, p. 516.

Class GASTEROPODA.

Subclass DIŒCA.

Order Toxoglossa Trosch.

PLEUROTOMIDÆ Trosch.

Mangelia Leach.

M? bicarinata, p. 349.

Clathurella Ger.

C. plicata, p. 350.

Bela Leach.

B. turricula, p. 351. B. harpularia, p. 352. B. violacea, p. 353. B. decussata, p. 354. B. cancellata and pleurotomaria, p. 355.

ADMETIDÆ Trosch.

Admete Möll.

A. viridula, p. 391.

Order Rhachiglossa Trosch.

Group *Odontoglossa.*

FASCIOLARIIDÆ Trosch.

Fusinæ.

Sipho H. & A. Ad.
S. Islandicus, p. 371.

BUCCINIDÆ.

Buccininæ.

Buccinum Linn.
B. undulatum Möll. (= undatum Gld. non Lin.), p. 366. B. Humphreysianum Benn. (= ciliatum Gld. non Fabr.), p. 368. B. Donovani, p. 369.

Chrysodominæ.

Chrysodomus Swains.
C. pygmæus, p. 372. C? ventricosus, p. 373. C. tornatus, p. 374. C. decemcostatus, p. 375.

[Note. C. lyratus Mart. is a closely allied but distinct species peculiar to the west coast of N. America.]

Fulgur Mont.
F. carica, p. 383.

Sycotypus (Browne) Gill.
S. canaliculatus, p. 380.

NASSIDÆ Trosch.

Nassinæ.

Nassa Lam.
N. vibex, p. 365 (= fretensis Perkins).
(*Tritia* H. & A. Ad.) T. trivittata, p. 364.
(*Ilyanassa* Stm.) I. obsoleta, p. 362.

Group *Hamiglossa.*

MURICIDÆ.

Muricinæ.

Eupleura H. & A. Ad.
E. caudata, p. 386.

Trophon Mont.
T. clathratus, p. 377. T. scalariformis, p. 378. T. muricatus, p. 379.

Urosalpinx Stm.
U. cinerea, p. 370.

Purpurinæ.

Purpura Brug.
P. lapillus, p. 361.

PTYCHATRACTIDÆ Stm.

Ptychatractus Stm.
P. ligatus, p. 385.

COLUMBELLIDÆ Mörch.

Astyris[1] H. & A. Ad.
A. rosacea, p. 357. A. dissimilis, p. 358. A. lunata, p. 359.

Anachis H. & A. Ad.
A. avara, p. 357.

[1] A number of West Coast species, referred to *Amycla* by most authors, belong to this section. The type of *Amycla* (*Buc. corniculum* Oliv.) is Nassoid, not Columbelloid, *fide* Troschel. Geb. Schn., II, p. 90.

Order Tæniogllossa Trosch.

VALVATIDÆ Trosch.

Tropidina H. & A. Ad.
T. tricarinata, p. 286.

Lyogyrus Gill.
L. pupoideus, p. 288.

VIVIPARIDÆ Gill.

Campeloma[1] Raf.
C. decisa, p. 289.

RISSOIDÆ Stm.

Pomatiopsinæ Stm.

Pomatiopsis Tryon.
P. lapidaria, p. 295.

Amnicolinæ Gill.

Amnicola Gld. & Hald.
A. pallida, p. 292. A. limosa, p. 293. A. grana, p. 294.

Rissoinæ Stm.

Rissoa Frem.
R? multilineata, p. 300. R? exarata, R? Mighelsi and R? carinata, p. 301.

Cingula Flem.
C? minuta, p. 298. C? latior and C? aculeus, p. 299.

[Note. The material is not at hand, definitely to fix the generic place of these species.]

Skeneinæ Stm.

Skenea Flem.
S. planorbis, p. 296.

RISSOELLIDÆ H. & A. Ad.

Rissoella Gray.
R? eburnea and R? sulcosa, p. 297.

LITTORINIDÆ Trosch.

Littorininæ.

Littorina Fér.
L. litorea, p. 308. L. palliata, p. 309. L. irrorata, p. 311. L. rudis, p. 304. L. (var.?) tenebrosa, p. 306.

Lacuninæ.

Lacuna Turt.
L. vincta, p. 302. L. neritoidea, p. 303.

CERITHIIDÆ Trosch.

Cerithiinæ.

Bittium Leach.
B. nigrum, p. 321. B. Greenii, p. 322.

Triforis Desh.
T. nigrocinctus, p. 323.

Cerithiopsinæ.

Cerithiopsis[2] Fbs.
C. Emersonii, p. 387. C. terebralis, p. 389.

TURRITELLIDÆ Trosch.

Mesalia Gray.
M. erosa (= polaris Beck), p. 317. M. reticulata and cos-

[1] *Melantho* of Bowditch cannot be used, as the type is an unrecognizable marine fossil from the Paris basin; the name, therefore, would better be dropped.

[2] Placed by Troschel in the *Cerithiidæ*, to which it is closely allied.

tulata, p. 318. M. acicula, p. 319.

VERMETIDÆ Cpr.

Vermetus Adans.
V. radicula, p. 316.

CŒCIDÆ Cpr.

Cœcum Flem.
C. pulchellum, p. 315.

TRICHOTROPIDÆ Trosch.

Trichotropis B. & S.
T. borealis, p. 390.

CAPULIDÆ Trosch.

Calyptræinæ.

Crucibulum Schum.
C. striatum, p. 275.

Crepidula Lam.
C. fornicata, p. 271. C. convexa, p. 273. C. glauca, p. 274.
(*Ianachus* H. & A. Ad.) I. plana, p. 272.

APORRHAIDÆ Trosch.

Aporrhais (Da Costa) Dillw.
A. occidentalis, p. 320.

NATICIDÆ Trosch.

Natica Adans.
N. clausa, p. 343. N. pusilla, p. 344.

Lunatia Gray.
L. heros, p. 338. L. triseriata, p. 340. L. Grönlandica, p. 341. L? immaculata, p. 344.

Neverita Risso.
N. duplicata, p. 345.

Bulbus Brown.
B. flavus, p. 347.

Amauropsis Mœrch.
A. helicoides, p. 348.

VELUTINIDÆ.

Velutina Blainv.
V. haliotoidea, p. 334. V. zonata, p. 335.

MARSENIIDÆ Trosch.

Marsenia Leach.
M? perspicua, p. 337.

Order PTENOGLOSSA Trosch.

IANTHINIDÆ Gray.

Ianthina Lam.
I. fragilis, p. 277.

SCALARIIDÆ Gray.

Scalaria Lam.
S. Novangliæ, p. 311. S. lineata, p. 312. S. multistriata, p. 313.
(*Clathrus* [Oken] H. & A. Ad.) C. grönlandicus, p. 314.

Subclass EXOCEPHALA.

Order Rhiphidoglossa Trosch.

Suborder Scutibranchiata Gray.

liotiidæ Gray.

Adeorbis S. Wood.
A. costulata, p. 278.

trochidæ Gray.

Calliostoma Swains.
C. occidentalis, p. 286.

Margarita Leach.
M. cinerea, p. 279. M. minutissima and M. undulata, p. 280. M. helicina, p. 281. M. campanulata and M. argentata, p. 282. M. obscura, p. 283. M. acuminata, p. 284. M. varicosa, p. 285.

Suborder Dicranobranchiata Gray.

fissurellidæ.

Cemoria Leach. C. noachina, p. 276.

Order Docoglossa Trosch.

Suborder Cervicobranchiata Gray.

tecturidæ Gray.

Tectura Aud. T. testudinalis, p. 267. T. alveus, p. 269.

Suborder Abranchiata Gill.

lepetidæ Dall ex Gray.

Lepeta Gray. L. cœca, p. 270.

Order Polyplacophora Gray.

chitonidæ Gray.

Leptochiton Gray.
L. cinereus, p. 259. L? albus, p. 263.

Tonicia Gray.
T. ruber, p. 260. T. marmoreus, p. 261. T? mendicarius, p. 263. T? apiculatus, p. 258.

Amicula Gray.
A. Emersonii, p. 264.

Order CIRROBRANCHIATA Gray.

DENTALIIDÆ Gray.

Dentalium Linn.
D. dentale, p. 266.

Entalis Sby.
E. striolata, p. 266.

Subclass HERMAPHRODITA.

Order PULMONATA.

Suborder GEOPHILA.

LIMACIDÆ.

Limax Linn.
L. maximus, p. 407. L. agrestis, p. 408. L. campestris, p. 409. L. flavus, p. 410.

ARIONIDÆ H. & A. Ad.

Arion Fér.
A. fuscus, p. 451.

PHILOMYCIDÆ Gray.

Tebennophorus Binn.
T. caroliniensis, p. 457. T? dorsalis,[1] p. 460.

HELICIDÆ.

Tachea Leach.
T. hortensis, p. 429.

Mesodon Raf.
M. albolabris, p. 423. M. thyroides, p. 425. M. Sayi, p. 426.

Triodopsis Raf.
T. dentifera, p. 424. T. palliata, 420. T. tridentata, p. 422.

Stenotrema Raf.
S. hirsuta, p. 417. S. monodon, p. 418.

Anguispira Morse.
A. alternata, p. 412.

[The value of these sections of the *Helicidæ* is still a matter of much controversy, not but that most authors agree in dividing the old genus *Helix*, but that there is a wide diversity of opinion as to the boundaries of the groups.]

VITRINIDÆ Martens.

Vitrininæ.

Vitrina Drap.
V. limpida, p. 394.

Omphalina Raf.
O. inornata, p. 453. O. fuliginosa, p. 454.

Ventridens Binn.
V. suppressa, p. 454.

Macrocyclis Beck.
M. concava, p. 406.

Helicellinæ.

Hyalina Fér.
H. cellaria, p. 395. H. Binneyana, p. 400. H. arborea, p. 396. A. electrina, p. 397. H. indentata, p. 398. H. multidentata, p. 404.
(*Pseudohyalina*[2] Morse.) P.

[1] The genus *Pallifera* founded on this species, appears to need further confirmation, *vide* Binney.

[2] This subsection appears to have very slight characters.

exigua, p. 400. P. minuscula, p. 399.
(*Striatura* Morse.) S. milium, p. 401. S. ferrea, p. 401.
(*Conulus* Fitz.) C. chersinus, p. 402.

Valloniinæ.

Vallonia Risso.
V. minuta, p. 428.
Helicodiscus Morse.
H. lineata, p. 404.
Planogyra Morse.
P. asteriscus, p. 415.
Patula Hald.
P. striatella,[1] p. 413.
Strobila Morse.
S. labyrinthica, p. 415.
Punctum[2] Morse.
P. minutissimum, p. 403.

SUCCINIIDÆ Martens.

Succinea Drap.
S. ovalis, p. 445. S. avara, p. 446. S. obliqua, p. 447. S. Totteniana, p. 448.

PUPIDÆ Morse.

Zua[3] Leach.
Z. lubrica, p. 431.
Acanthinula Beck.
A. harpa, p. 427.
Pupilla Leach.
P. muscorum, p. 433. P. Hoppii, p. 433. P? pentodon, p. 434. P. decora, p. 435.
Leucocheila A. & M.
L. fallax, p. 436. L. armifera, p. 437. L. contracta, p. 438. L. rupicola, p. 439. L. corticaria, p. 439.
Isthmia Gray.
I. Gouldii, p. 440. I. milium, p. 441. I. Bollesiana, p. 442. I. ovata, p. 442. I. ventricosa, p. 443. I. simplex, p. 444.

Suborder LIMNOPHILA.

AURICULIDÆ.

Alexia Leach.
A? myosotis, p. 463.
Melampus Mont.
M. bidentatus, p. 467.
Carychium Müll.
C. exiguum, p. 466.

[1] Quite distinct from *P. Cronkheitii*, of which I have authentic specimens.

[2] This genus, in the form of a subfamily, would require to be transferred to the *Orthalicidæ*, if the conformation of the jaw, as figured by Morse, should be confirmed. The jaw of *H. pygmæa* figured by Lindeström (Gotl. Moll., Pl. iii, fig. 12), shows characters which indicate that some misapprehension has occurred; which is not at all improbable considering the extreme minuteness of the object.

[3] Compare the dentition of this species, as figured by Morse, with that of *Vallonia minuta*. Also *Strobila* with *Leucocheila corticaria* and *Pupilla badia*; also *Punctum* with *Carychium* and *Planogyra* with *Isthmia ovata*. The distinction between *Leucocheila*, as it stands, and *Pupilla*, is very fine drawn and not at all definite.

LIMNÆIDÆ Dall. (Ann. Lyc. N. Hist., N. Y., 1870.)

Limnæinæ Dall.

Limnæa Lam.

(*Limnophysa* Fitz.) L. elodes, p. 475. L. desidiosa, p. 478. L. umbilicata, p. 480. L. pallida, p. 481. L. humilis, p. 482. L? columella, p. 471. L? catascopium, p. 479.

(*Radix* Mont.) R. ampla, p. 474. R? decollata, p. 473.

Planorbinæ Dall.

Planorbis Guett.

P. lentus, p. 490.

(*Planorbella* Hald.) P. campanulata, p. 492.

(*Helisoma* Swains.) H. trivolvis, p. 488. H. bicarinata, p. 491.

(*Menetus* H. & A. Ad.) M. exacutus, p. 495.

(*Gyraulus* Ag.) G. deflectus, p. 494. G. elevatus, p. 497. G. dilatatus, p. 498. G. parvus, p. 497. G. albus (= hirsutus Gld.), p. 493.

Planorbula Hald.

P. armigera, p. 499.

ANCYLIDÆ Menke.

Ancylus Geoff.

A. parallelus, p. 501. A. fuscus, p. 502.

PHYSIDÆ Dall. (An. Lyc. N. H., N. Y., 1870.)

Physinæ Dall.

Physa Drap.

P. heterostropha, p. 483. P. ancillaria, p. 485.

Bulinus Adans.

B. hypnorum (= elongatus Gld.), p. 486.[1]

Order TECTIBRANCHIATA.

PHILINIDÆ.

Philine Asc.

P. sinuata, p. 213. P. quadrata, p. 213. P. lineolata, p. 214.

Scaphander Montf.

S. puncto-striatus, p. 215.

AMPHYSPIRIDÆ Gray.

Diaphana Brown.

D. debilis, p. 216.

PYRAMIDELLIDÆ.

Odostomia Flem.

O. producta, p. 325. O. fusca, p. 325. O. dealbata, p. 327. O. modesta, p. 327. O. bisuteralis, p. 327. O. trifida, p. 328. O? seminuda, p. 329. O? impressa, p. 330.

Turbonilla Leach.

T. interrupta, p. 321. T. nivea, p. 231.

[1] The figure (737) is exceedingly erroneous. (*Cf.* generic diagnosis, same page.) I would mention that in numerous dissections of species of *Physa* and *Bulinus*, I have been unable so far to find more than a cartilaginous membrane in place of a jaw.

Eulima Risso.
E. oleacea, p. 332.
Menestho Müll.
M. albula, p. 333.

ACTÆONIDÆ Gray.

Actæon Montf.
A. puncto-striata, p. 224.

CYLICHNIDÆ.

Cylichna Lovén.
C. alba, p. 220. C. oryza, p. 221.

Utriculus Brown.
U. Gouldii, p. 217. U. pertenuis, p. 218. U. canaliculatus, p. 219.

BULLIDÆ.

Akera Brown.
A? hyemalis, p. 216.
Bulla Linn.
B. solitaria and B. incincta, p. 222. B. occulta, p. 223.

Order NUDIBRANCHIATA.

Suborder PYGOBRANCHIATA Gray.

GONIODORIDÆ Gray.

Ancula Lovén.
A. sulphurea, p. 233.

POLYCERIDÆ Gray.

Polycera Cuv.
P. Lessonii, p. 226.

DORIDIDÆ Gray.

Doris Linn.
D. bilamellata, p. 228. D. tenella, p. 229. D. pallida, p. 229. D. diademata, p. 230. D. planulata, p. 331. D. pilosa, p. 332. D. grisea, p. 332.

Suborder CERATOBRANCHIATA Gray.

HERMÆIDÆ Gray.

Hermæa Lovén.
H. cruciata, p. 253.
Alderia Allman.
A. Harvardiensis, p. 254.

ÆOLIDIIDÆ.

Æolidia Cuv.
Æ. papillosa, p. 238. Æ. salmonacea, p. 240. Æ. Bostoniensis, p. 241. Æ. rufibranchialis, p. 242. Æ. pilata, p. 243. Æ. stellata, p. 245. Æ. purpurea, p. 246. Æ. picta, p. 246. Æ. diversa, p. 247.
Tergipes Cuv.
T. despecta, p. 248. T. gymnota, p. 249.
Calliopæa D'Orb.
C? fuscata, p. 250.
Embletonia Ald. & Han.
E. fuscata, p. 251. E. lanceolata, p. 252. E. remigata, p. 252.

DOTONIDÆ Gray.

Doto Oken.
D. coronata, p. 236.

DENDRONOTIDÆ Gray.

Dendronotus Ald. & Han.
D. arborescens, p. 234.

Suborder PLACOBRANCHIATA Gray.

ELYSIIDÆ Gray.

Elysia Risso.
E. chlorotica, p. 255.

Placobranchus Van Hass.
P. catulus, p. 256.

Suborder PELLIBRANCHIATA Gray.

LIMAPONTIIDÆ Gray.

Limapontia Forbes. L. zonata, p. 258.

Subclass PTEROPODA.

Order THECOSOMATA.

LIMACINIDÆ Trosch.

Heterofusus Flem.
H. balea? p. 505. H. retroversus, p. 505.

HYALIIDÆ Trosch.

Diacria Gray.
D. trispinosa, p. 504.

CYMBULIIDÆ Trosch.

Psyche Rang.
P. globulosa, p. 504.

Order GYMNOSOMATA.

CLIONIDÆ Trosch.

Clione Pall. C. limacina, p. 507.

Class ACEPHALA.

Order DIMYARIA.

Group *Pholadacea.*

TEREDINIDÆ.

Teredo Linn.
T. navalis, p. 28. T. norvegica, p. 29. T. megotara, p. 30. T. Thomsonii, p. 21. T. dilatata, p. 32.

Lyrodus Gld.
L. chlorotica, p. 33.

Xylotrya Leach.
X. fimbriata, p. 34.

PHOLADIDÆ.

Pholas Linn.
P. costata, p. 36. P. truncata, p. 38.

Zirphæa Leach.
Z. crispata, p. 39.

Group *Solenacea.*

SOLENIDÆ.

Ensis Schum.
E. ensis, p. 40.

SOLECURTIDÆ.

Tagelus [1] Gray.
T. gibbus, p. 43. T? divisus, p. 45.

Siliqua Muhlf.
S. squama, p. 46. S. costata, p. 47.

Group *Myacea.*

SAXICAVIDÆ.

Panopæa Men.
P. arctica, p. 51.

Cyrtodaria Daud.
S. siliqua, p. 53.

Saxicava Bellv.
S. rugosa, p. 87. S. arctica, p. 89.

MYIDÆ.

Mya Lin.
M. arenaria, p. 55. M. truncata, p. 58.

CORBULIDÆ.

Corbula Brug.
C. contracta, p. 60.

Næera Gray.
N. pellucida, p. 61.

PANDORIDÆ Desh.

Clidiophora Cpr.
C. trilineata, p. 62.

ANATINIDÆ.

Lyonsia Turt.
L. hyalina, p. 64. L. arenosa, p. 65.

Anatina Lam.
A. papyracea, p. 66.

Cochlodesma Couth.
C. leana, p. 68.

Thracia Leach.
T. Conradi, p. 64. T. myopsis, p. 71. T. truncata, p. 72.

Group *Veneracea.*

MACTRIDÆ.

Spisula Gray.
S. solidissima, p. 73. S. ovalis, p. 75.

Mulinia Gray.
M. lateralis, p. 77.

[1] Not *Macha* Gray, *Siliquaria* Brug. and Lam., nor *Solecurtus* Blainv.

MESODESMIDÆ Desh.

Ceronia Gray.
C. arctata, p. 80. C. deaurata, p. 81.

AMPHIDESMIDÆ Desh.

Cumingia Br. & Sby.
C. tellinoides, p. 79.

TELLINIDÆ Desh.

Macoma Leach.
M. fusca, p. 93. M. proxima, p. 95.

Angulus Men.
A. tenera, p. 97.

Peronæa Poli.
P. tenta, p. 96.

PETRICOLIDÆ.

Petricola Lam.
P. pholadiformis, p. 90. P. dactylus, p. 92.

VENERIDÆ Desh.

Callista Poli.
C. convexa, p. 131.

Mercenaria Schum.
M. mercenaria, p. 133. M. notata, p. 135.

Liocyma Dall. n. g.
L. fluctuosa Gld., p. 136 (v. d.).

Gemma Desh.
G. gemma, p. 137. G. manhattensis, p. 138.

Group *Corbiculacea.*

CORBICULIDÆ.

Sphœrium Scop.
S. similis, p. 101. S. partumeium, p. 103. S. rhomboideum, p. 104. S. Vermontanum, p. 105. S. truncatum, p. 106. S. tenue, p. 107. S. securis, p. 107. S. occidentale, p. 108.

PISIDIIDÆ Gray.

Pisidium Pfr.
P. dubium, p. 109. P. Adamsi, p. 110. P. compressum, p. 110. P. æquilaterale, p. 112. P. ferrugineum, p. 113. P. abditum, p. 113. P. variabile, p. 115. P. ventricosum, p. 116.

Group *Cardiacea.*

CARDIACEA.

Cyprina Lam.
C. Islandica, p. 129.

Cardium Linn.
C. Islandicum, p. 139. C. elegantulum, p. 141. C. pinnulatum, p. 141.

Liocardium (Sw.) Mœrch.
L. Mortoni, p. 143.

Serripes[1] Beck.
S. Grönlandicus, p. 144.

[1] *Aphrodite* is in use for a well known genus of marine worms. The *Serripes?* (*La Perousii*) of the N. W. Coast of America, hardly to be distinguished by the shell from the type of the genus, has a smooth, cylindrical foot, without serrations. This throws some doubt on the value of the genus.

Group *Lucinacea.*

LUCINIDÆ Desh.

Lucina Brug.
L. filosa (? = borealis), p. 98.
Cyclas H. & A. Ad.
C. dentata, p. 99.
Cryptodon Turt.
C. Gouldii, p. 100.

LEPTONIDÆ Cpr.

Kellia Turt.
K. planulata, p. 83. K. suborbicularis, p. 83.
Turtonia Alder.
T. minuta, p. 85.
Montacuta Turt.
M. elevata, p. 86.

SOLEMYIDÆ Desh.

Solemya Lam.
S. velum, p. 48. S. borealis, p. 50.

Group *Carditacea.*

CRASSATELLIDÆ.

Gouldia C. B. Ad.
G. mactracea, p. 128.
Astarte Sby. (not Conr.)
A. castanea, p. 117. A. sulcata, p. 119. A. semisulcata, p. 121. A. quadrans, p. 123. A. elliptica, p. 124. A. Banksii, p. 125. A. crebricostata, p. 126. A. portlandica, p. 127.

CARDITIDÆ.

Venericardia Lam.
V. borealis, p. 146. (Add V. novangliæ Morse.)

Group *Naiades.*

UNIONIDÆ Cpr.

Unio Retz.
U. complanatus, p. 167. (= Naia Perkins not Swains.)
(*Eurynea* Stm.) E. nasuta, p. 169.
(*Lampsilis* Stm.) L. radiata, p. 170. L. ochracea, p. 173. L. cariosa, p. 172.
Margaritana Schum.
M. arcuata, p. 174.
(*Alasmodonta* (Say) Stm.) A. marginata, p. 177. A? undulata, p. 176.
Anodonta Brug.
A. fluviatilis, p. 178. A. implicata, p. 180. A. undulata, p. 182.

Group *Arcacea.*

NUCULIDÆ.

Nucula Lam.
N. tenuis, p. 149. N. proxima, p. 150. N. expansa, p. 152. N. inflata, p. 152. N. delphinodonta, p. 153.

LEDIDÆ.

Yoldia Möll.

Y. limatula, p. 154. Y. obesa, p. 155. Y? siliqua, p. 156. Y. thraciæformis, p. 157. Y. sapotilla, p. 159. Y. myalis, p. 160.

Leda Schum.

L. tenuisulcata, p. 161. L. Jacksonii, p. 163. L. minuta, p. 164. L. caudata, p. 165.

ARCIDÆ Desh.

Argina Gray.

A. pexata, p. 147.

Scapharca Gray.

S. transversa, p. 148.

Order HETEROMYARIA.

Group *Mytilacea.*

MYTILIDÆ.

Mytilus Linn.

M. edulis, p. 183.

Modiola Lam.

M. modiolus, p. 186. M. plicatula, p. 188.

Modiolaria Gray.

M. nigra, p. 190. M. discors, p. 192. M. corrugata, p. 193.

Crenella Brown.

C. glandula, p. 194. C. pectinula, p. 195.

Order MONOMYARIA.

Group *Ostracea.*

PECTINIDÆ Cpr.

Pecten Brug.

P. tenuicostatus, p. 197. P. Islandicus, p. 198. P. irradians, p. 199. P. fuscus, p. 200.

LIMIDÆ Cpr.

Lima Brug.

L. sulculus, p. 200, Note.

ANOMIIDÆ Cpr.

Anomia Lam.

A. ephippium, p. 204. A. aculeata, p. 204. A. electrica, p. 205. A. squamosa, p. 206.

OSTREIDÆ Desh.

Ostrea Linn.

O. Virginica, p. 202. O. borealis, p. 203.

Class TUNICATA.

Order NECTASCIDIA Kef.

SALPIDÆ.

Salpa Forsk. S. Caboti, p. 6.

Order Chthonascidia Kef.

Group *Ascidiæ compositæ.*

DIDEMNIDÆ.

Didemnium Sav.
D. roseum, p. 4.

BOTRYLLIDÆ H. & A. Ad.

Botryllus Lam.
B. schlosseri, p. 3.

Group *Ascidiæ simplices.*

PELONÆIDÆ.

Pelonæia Fbs. & Goods.
P. arenifera, p. 27.

ASCIDIIDÆ.

Ascidia Baster.
A. amphora, p. 23. A. psammophora, p. 24. A. occellata and A. tenella, p. 24. A. carnea and A. Manhattenensis, p. 25. A? callosa, p. 26.

Cynthia Sav.
C. pyriformis, p. 17. C. partita, p. 18. C. gutta, p. 19. C. placenta, p. 19. C. condylomata, p. 19. C. rugosa, p. 20. C? echinata, p. 18. C? hirsuta, p. 20.

Molgula Fbs.
M. arenata, p. 21. M. producta, p. 21.

Glandula Stm.
G. mollis, p. 22. G. fibrosa, p. 22.

CHELYSOMATIDÆ.

Chelysoma B. & S.
C. geometricum, p. 26.

BOLTENIIDÆ.

Boltenia Sav.
B. clavata, p. 14. B. rubra, p. 15. B. microcosmus, p. 16. B. Burkhardti, p. 16.

Class BRACHIOPODA.

Order Ancylobrachia Gray.

TEREBRATULIDÆ Dav.

Terebratulinæ.

Terebratulina D'Orb.
T. septentrionalis, p. 208.

Waldheimia King.
W. cranium? p. 211.

Order Helictobrachia Gray.

RHYNCHONELLIDÆ Dav.

Rhynchonella Fisch. R. psittacea, p. 210.

Liocyma Dall, n. g. (*Λεῖος*, smooth, and *κῦμα*, wave.) Shell trigonal or elongate-ovate, small, thin, smooth; furnished with concentric undulations and occasionally fine radiating lines; provided with a polished epidermis; pallial sinus small, rounded triangular; hinge teeth three in each valve, divaricate; middle tooth largest, grooved on the upper edge. Lunule faint, no areola, ligament set in below the exterior surface. Soft parts: — siphons equal, short, provided with numerous cylindrical papillæ around the apertures, no valve in either siphon, both closely united, to their tips. Branchiæ; inner layer extending from the posterior to the anterior adductor, broadly triangular, pointed behind; outer layer short, spatulate, narrow and close to the post adductor; mantle smooth, united around the siphons and before the foot, with an opening nearly as long as the shell for the passage of the foot; the latter is elongate-rhomboidal, with the edges sharply compressed, anterior extremity pointed, lanceolate. Palpi four; upper pair slender, narrow, pointed, smooth; lower pair stouter, dextrally spiral, with two turns. Type, *Venus fluctuosa* Gould, Inv. Mass., 1841, p. 47, pl. iii, fig. 50. Binney, Inv. Mass., 2d ed., p. 136, fig. 447 (young).

The type of this genus was referred to *Venus* and *Tapes* by Gould, to *Chione* and *Tapes* by Deshayes, and finally to *Anaitis* by Roemer. The latter name is preoccupied in Lepidoptera as well as Botany, and must therefore be dropped. This species, moreover, does not agree with the types of Roemer's genus. Dr. Gould's original figure and description refer to one of two species which appear to have been confounded under the same name. They may be characterized as follows: —

Liocyma fluctuosa Dall ex Gould.

Venus fluctuosa Gld., Inv., 1841, p. 87, pl. iii, fig. 50. Otia Conch., p. 181. Stm., Sh. of N. E., p. 19. Binn., Inv., 2d ed., p. 136, fig. 447 (jun.). De Kay, Nat. Hist. N. Y., p. 220.

Venus astartoides Beck, Midd. Mal. Ros., III, p. 56. Sib. Reise, Moll., p. 252, pl. xx, figs. 5–14. Philippi, Abb. u. Beschr., III Bd., p. 61, t. ix, fig. 4. Sowerby, jun., Thes. II, 737, pl. cxxxviii, fig. 157.

Tapes fluctuosa Gld., Otia, p. 181. Deshayes, B. M. Cat. Biv., p. 176, n. 47. H. & A. Ad., Gen. Rec. Moll., II, p. 435 (not of Sowerby).

Chione astartoides Desh., (!) B. M. Cat. Biv., p. 147.

Chamelea astartoides H. & A. Ad., (!) Gen. Rec. Moll., II, p. 423.

Testa parva, tenui, compressa, ovali, pallide fulva minutè transversim striata, inæquilaterali, anticè obtusa, posticè longiore, subangulata : striis vix convexiusculis ; epidermidè tenui, nitida, straminea induta ; umbonibus parvis ; lunula cordata, polita ; area nulla. Lon. 0.8 ; *alt.* 0.6 ; *lat.* 0.2 *poll.*

Distinguished by its oval shape, produced ventral margin, produced and rounded extremities, compressed form and inconspicuous umbones. The radiating striæ are very faint and often wanting. The concentric undulations are usually flattened, and the pallial sinus rounded and very small. A beautiful variety from the Arctic Ocean is of a delicate pea green, which pervades the soft parts as well as the glossy epidermis. It is known from Nova Scotia, Hudson's Bay, Ochotsk Sea, Kadiak, Fort Simpson in British Columbia, and the Gulf of Penjinsk. The soft parts, especially the mantle and siphons, differ from any described genus of Veneridæ. There is no byssus or byssal groove, nor any indication of a lateral tooth. The edge of the mantle is smooth; the soft parts are greenish white.

I have seen a specimen from Penjinsk Gulf an inch and a half long, and it grows to a considerable size on the Grand Banks. The specimens obtained in Nova Scotia are usually rather immature, as figured by Binney.

Liocyma Beckii n. s.

Testa ovato-trigona, subæquilaterali, tumida, nitidissima ; irregulariter concentricè sulcata ; alba aut lutescente ; margine dorsali vix angulato ; lunula lanceolata, nitida, linea parum inconspicua circumscripta ; ligamento inconspicuo, insesso ; area nulla ; sinu palliari parvo, angulato ; margine integro ; umbonibus prominentibus ; dentibus cardinalibus in utraque valva tribus divergentibus, dentibus lateralibus nullis. Lat. 0.4; *lon.* 0.56; *alt.* 0.54 *poll.*

Distinguished by its rounded umbones and moderate tumidity, by the angulated hinge margin, short, anterior extremity, less arcuated ventral margin and small size. The area occupied by the hinge teeth is shorter and wider than in the last species, from which its trigonal shape immediately distinguishes it. Over one hundred specimens were collected at Plover Bay, E. Siberia, agreeing with each other and differing from the young of the last species, as above. One specimen was dredged alive at Ounga Island, near Aliaska. The soft parts were white, and the siphons of a deep pink, darker toward the ends. The pallial line is very broad.

The Secretary read the following observations of Mr. L. Trouvelot upon the tendency of trees to bend toward the east.

In the *Scientific American* of March 5th, 1870, is inserted a paragraph headed "The Growth of Tree Trunks." It is there stated that a French naturalist had been measuring the tree trunks in a forest, and had found them all broader in the east-west than in the north-south direction, while another arborist of Toulouse, similarly gauging the trees, found the greatest swelling of their trunks towards the east-southeast; the former attributing this want of symmetry to the rotation of the earth, while the latter thinks that it is due to the early action of the sun upon the sap. As this paragraph reminded me of some observations which I made some five or six years ago, and which bear closely upon the same subject, I will present them to the Society, thinking they may have some value in a scientific as well as in a practical point of view. While in the country, if we observe attentively the tree tops, we will soon perceive that many species seem affected by a steady wind, though there is not the least breeze to be felt. Soon we notice that the branches of a great many trees have a general tendency to obey an unknown force which bends their extremities towards the east, or perhaps more correctly, in a direction perpendicular to the magnetic meridian. This bending of small branches cannot be observed so plainly upon all kinds of trees; some species having it well marked in every instance, while other species have it less visible, and even some others not at all noticeable. Most prominent for this peculiarity is the cherry tree, sometimes bending its branches towards the east, from head to foot. Next to this come the maple, the button wood tree (*Platanus*), then the pear tree, then the oak, etc. In the last named it is not always noticeable, though if the tree is isolated from others it is very plain in every instance. With the cherry tree it is so certain, that one could almost invariably determine the cardinal points by looking at the direction of its branches. At first I thought this might be due to the action of the prevailing winds, but this hypothesis was somewhat shaken, when I saw in many instances cherry trees sheltered entirely from the west winds by high blocks of houses within a few feet of them, exhibiting the same phenomenon. Whether this direction of the branches of trees is to be attributed to the prevailing winds, or to the rotation of the earth upon its axis, or to the heat or light of the sun, or again,

to terrestrial magnetism, I shall not inquire at present; not having sufficient data to establish any theory. It would be of value, I venture to say, if observers would direct attention to this subject, and see if the direction is the same all over the globe, or if it is a local phenomenon, and also ascertain what species of trees obey this unknown force.

It is not only in a theoretical point of view that this observation has some value; there is in it a practical lesson for the cultivators of shade and fruit trees. Soon after my observations, it struck me that something practical could be derived from this truth. All country people know by experience—sometimes dearly bought—that the transplantation of trees does not always succeed, and especially when the transplanted trees have arrived at a certain age. Fruit growers tell us that the cherry tree is one of those least likely to live when transplanted, while the apple tree will almost invariably succeed. My observations on many thousand cherry trees have shown me that this tree is very sensitive to the unknown force, while the apple tree is a great deal less so, and it is very seldom that an indication of bending will be seen. Has not this anything to do with success in transplanting? If, without regard to the direction of the branches of a cherry tree, we set this tree in a position contrary to the one it occupied before, its branches now bending towards the west, then it is plain that the force which gave it the bend is acting in an opposite direction; in consequence of which the tree is suffering. But with the apple tree it is different, as this is far less sensitive; therefore it will not suffer so much. Ten years ago I bought a fine cherry tree and transplanted it to my garden, of course without regard to direction; the tree is now living; it has not grown a particle; there has not been one inch of new wood added to the length of its twigs since it was put there; the branches have no bend. Five years ago another cherry tree from the same place was also transplanted in my garden; the tree is now treble the size of the other, its branches are strongly bent east. Why this difference? Was the one set in a suitable position, and the other not? I could not tell. But here is something more positive: three years ago I saw in Malden twenty beautiful pear trees transplanted with the greatest care; all these trees were of pretty good size, being some years old, and they all bent very strongly. They were set without regard to direction; five or six of these trees happened to be placed in about the position which they must have had when growing; the remainder were set in

all directions. I went many times that way to watch the success of this small orchard. The very first year about one half were completely dead. The second year took five more, which had been languishing all summer; and now five out of the twenty are living and in good condition; and, strange to say, these five are those which were set with their branches dipping east. Do they owe their life to the fact that after being transplanted they occupied the same relative position with regard to the points of the compass as before? or is it only a curious coincidence? It is more than I can tell. My experience is not sufficient to allow an opinion in this matter; time will throw light upon the subject.

The following paper was also presented:—

Notes on Massachusetts Reptiles and Batrachians.
By J. A. Allen.

Plestiodon fasciatus D. & B. (Blue tailed Skink.)

A living specimen of this species was received a few months since by the writer from Mr. R. C. Ingraham, who, in company with Mr. George Hunt, captured it in June, 1869, "near Howland's Spring, so-called, in New Bedford." This species occurs sparingly in the southern counties of New York, and still less frequently in southern Connecticut. In Massachusetts it is almost unknown, this being the second known instance of its capture in this State. Dr. Storer reported the capture of the first specimen in Barre, where it was taken by Dr. Joseph N. Bates,[1] nearly thirty years ago. The New Bedford specimen is preserved in the Society's collection.

Malacoclemmys palustris Agassiz. (Marsh Terrapin.)

This species having been long known to occur in considerable numbers on Long Island, and the opposite shore of Connecticut, I had supposed that it might also exist on the southern coast of Massachusetts. In kind response to inquiries addressed to him respecting the subject, Mr. Ingraham, of New Bedford, wrote me some months since as follows: "The Marsh Terrapin is found here up the river. The fishermen send them to New York; here they are seldom eaten. They are more plenty in Wareham, and are also, as a gentleman informed me, found in Nantucket." This was the first information I received of its occurrence in this State, no instance of its capture in Massachusetts being heretofore on record. About two months since

[1] Storer's Report on the Fishes and Reptiles of Massachusetts, p. 219.

a living specimen was received at the Museum of Comparative Zoölogy from Wareham. The specimen from the vicinity of New Bedford, which was exhibited at the last meeting of the Society (March second), was sent by Mr. Ingraham as a donation to the Society's Museum. Mr. Ingraham writes that the specimen was taken "by Mr. Richard Durfey, in the Acushnet River, New Bedford, above the bridge."

Celuta amœna B. & G. (Ground Snake.)

Mr. Ingraham also informs me of the capture of this rare snake in New Bedford, a single specimen of which was taken in a garden on Eighth Street, near the centre of the city; the only specimen, Mr. Ingraham observes, that he has ever seen.

Hyla "squirella."

A small green tree frog is recorded under this name in my recent Catalogue of the Batrachians of the State.[1] Professor Cope having since examined my specimens, regards them as the young of *Hyla versicolor*, the adult of which, however, they are exceedingly unlike. Professor Cope furthermore informs me he doubts the occurrence of the true *Hyla squirella* so far north as the New England States. This being true, the single dried specimen of a small tree frog, referred by Dr. Storer to the *H. squirella*,[2] was in all probability also a young *H. versicolor*; to which also is doubtless to be referred the *H. squirella* of Jones, announced by him as having been recently discovered in Nova Scotia.[3] The *H. Richardi*, instead of being a synonym of *H. squirella*, should hence be referred to the *H. versicolor*.[4]

The following annotated list of the Reptiles and Batrachians of the vicinity of New Bedford has been kindly placed at my disposal by Mr. R. C. Ingraham of that place. While not regarded by Mr. Ingraham as a complete list, it embraces many facts of interest, and clearly indicates the decidedly southern character of the reptilian fauna of the southern coast of the State, as compared with that of the other portions. The great difference in the marine fauna of the coast north and south of Cape Cod has long been noticed, and an adequate cause for it recognized in the relatively near approach of the Gulf Stream to this portion of the New England coast. The

[1] Proceedings of this Society, Vol. XII, Dec., 1868, p. 189.

[2] Report on the Fishes and Reptiles of Massachusetts, p. 242.

[3] T. Matthew Jones, Transact. Nova Scotian Inst. Nat. Sci., Vol. II, pt. ii, p. 102, 1869.

[4] See on this point these Proceedings, Vol. XII, p. 189.

effect of its influence upon the distribution of the land animals is also quite apparent, though less marked than upon the marine. It is clearly indicated by the more frequent occurrence of Southern forms on this portion of the New England coast than in the interior, or further north, of which the existence of the Marsh Terrapin at New Bedford and Wareham is an illustration. An important negative feature in Mr. Ingraham's list is the absence of *Glyptemys insculpta* which he writes me he has not seen there, and that if occurring there it must be very rare.

REPTILES.

TESTUDINATA.

1. *Cistudo virginea* Ag. Not common. I generally see from one to three yearly. A few years since I found one that had just eaten half the pileus of a very large *Agaricus*—not the common edible one —with a pileus six or eight inches across. The manner in which it was eaten attracted my attention more than the fact of its eating it. It had evidently chipped it off in sections, going alternately from side to side, and leaving it as if divided by a straight cut through the pileus.

2. *Nanemys guttata* Ag. Common.

3. *Chrysemys picta* Gray. Common.

4. *Ozotheca odorata* Ag. This species cannot, I think, be very common. I have seen but one specimen, which I found dead in a muddy ditch.

5. *Chelydra serpentina* Schw. Frequent.

6. *Malacoclemmys palustris* Ag. Frequent.

SAURIA.

7. *Plestiodon fasciatus* Dum. and Bib. One specimen, June, 1869.

OPHIDIA.

8. *Tropidonotus sirtalis* Holbr. Common.

9. *Lampropeltis triangula* Cope. Frequent.

10. *Bascanion constrictor* B. & G. Frequent.

11. *Liopeltis vernalis* Cope. Frequent; formerly very common.

12. *Diadophis punctatus* B. & G. Not common.

13. *Carphophiops amœnus* Cope. A single specimen, taken in a yard, on Eighth St.

BATRACHIA.

ANURA.

1. *Bufo americanus* LeConte. Very common.
2. *Hyla versicolor* LeConte. Frequent.
3. " *Pickeringii* LeConte. Common.
4. *Rana Catesbiana* Shaw. Common.
5. " *clamitans* Daud. Common.
6. " *palustris* LeConte. Common.
7. " *halecina* Kalm. Common.
8. " *sylvatica* LeConte. Common.

URODELA.

9. *Plethodon erythronotus* Baird. Common.
10. *Diemictylus miniatus* Raf. Said to be frequent on Sconticut Point. I found but one last season.
11. *Diemictylus viridescens* Raf. Common.
12. *Amblystoma punctatum* Baird. Two specimens taken last season; both in the suburbs of the city, one in a cellar.

Section of Entomology. March 23, 1870.

Mr. S. H. Scudder in the chair. Nine persons present.

Mr. Walter Faxon was elected a member of the Section.

The following paper was presented: —

Synopsis Pseudoscorpionidum synonymica.

Dr. H. Hagen.

[Genera and species which will stand are marked †: all others are synonyms.]

Acarus Linné.

cancroides L., Faun. Suec., ed. I, 345, n. 1187; ed. II, 480, n. 1968; Syst. Nat., ed. X, 616, n. 7; Iter Oeland, 24. Clerck, Aran., t. 6, f. 10, n. 1, 2. Seba, Mus., I, t. 70, f. 11. Muell., Fn. Fridr., 91, n. 815. = *Chelifer cancroides* L.

scorpio-araneus L., Elench. anim., 88, n. 6. Frisch, Deutschl. Ins., VIII. = *Chelifer cancroides* L.

† BLOTHRUS Schioedte, 1851.

Schioedte, Dansk. Vid. Selsk. Skr., II, 23.

† **spelaeus** Sch., Dansk. Vid. Selsk. Skr., II, 23, t. 1, f. 2. Adelsberg and Magdalen Cave, Europe.

† CHEIRIDIUM Menge, 1855.

Menge, Chernetid., 36.

† **Hartmanni** Menge, Berendt, Organ. Reste im Bernstein, II, i, 96; Chernet., 38, t. 5, f. 12, 13. Fossil, Amber.

† **museorum** Leach, Menge, Chernet., 36, n. 1, t. 5, f. 11; t. 1, f. 1, 18, 24; t. 3, f. 4, 5, 16–18. Europe.

CHELIFER Geoffroy, 1764.

Geoffr., Hist. abrég. des Ins., II, 617. Leach, Trans. Linn. Soc. Lond., IX, 391; Zoöl. Miscell., III, 49. Hermann, Apt., 112. Latr., Preçis, 186; Hist. nat., VII, 138; Gen. Crust., I, 132; Considérat., 118; Famil. nat., 305; Cuv., Règne anim., ed. Voigt., IV, 405. Blanchard, Organisat. du Règne anim., fasc. Menge, Chernet., 29.

acaroides Hahn, Arachn., II, t. 60, f. 140. = *Chelifer ixoides* Hahn.[1]

† **acaroides** Latr., Hist. nat., VII, 142, n. 3. Hermann, Apt., 117, n. 4. Europe.

† **americanus** DeGeer, Mém., VII, 353, t. 42, f. 1–5; Retzius, Gen., 215. Surinam.

angustus Koch, Deutschl. Myriap., fasc. 7 (Panzer, Fn. Germ., fasc. 140), n. 5. =*Chelifer DeGeerii* ♂ (teste Koch.)

† **Berendtii** Menge, Koch u. Berendt, Organ. Reste im Bernstein, I, ii, 96; Menge, Chernet., 32, t. 4, f. 7. Fossil, Amber.

† **brachydactylus** Lucas, Explor. de l'Algér. Algeria.

† **Bravaisii** Lucas, Ann. Soc. Ent. Fr., sér. I, T. XI, p. xlvi. Algeria.

† **brevimanus** Kolenati, Bull. Moscou, 1857, II, 430. Caucasus.

† **cancroides** L., Latr., Gen. Crust., I, 132, n. 1; Cuv., Règne anim., ed. Voigt., IV, 406, n. 1; Hist. nat., VII, 141, t. 61, f. 2. Hermann, Apt., 118, n. 1, t. 5, f. R. Hahn, Arachn., II, 52, t.

[1] The name acaroides in the plate is changed in the description to ixoides.

60, f. 139. Koch, Arachn., x, 41, t. 338, f. 780. Roesel, Insect. Bel., III, t. 64. Frisch, Deutschl. Ins., VIII, 2, t. 1. Menge, Chernet., 30, n. 1, t. 4, f. 5; t. 1, f. 2, 3, 5–8, 15; t. 2, f. 1, 2, 3, 5–14; t. 3, f. 1, 2, 8–12. Walcken., ed. Gervais, III, 77. Duméril, Considér., 237, t. 56, f. 4. Hardwicke's Science Gossip, 1867, No. 35, 244. De Théis, 69, t. 3, f. 1. Aldrovand., p. 187. Hook, Microgr., 207, t. 23, f. 2. Albin, Aran., t. 36, f. 181. Hagen, Record Amer. Entom., 1868, 51. Europe; N. America.

carcinoides Herm., Apt., 118, n. 6, t. 5, f. 6.
= *Obisium carcinoides* Herm. (teste Koch.)

cimicoides F., Latr., Gen. Crust., I, 133, n. 2; Cuv., Règne anim., ed. Voigt, IV, 406, n. 2; Hist. nat., VII, 142, n. 2. Walcken., ed. Gervais, III, 78.
= *Chernes cimicoides* F. (teste Menge.)

† **corallifer** Loew, Dipterolog. Beitr., I, 29, Nota. Hungary.

† **corticalis** Hahn, Arach., II, 63, t. 64, f. 154. Europe.

DeGeerii Koch, Arachn., x, 53, t. 341, f. 788, mas; f. 789, fem.; Deutschl. Myriap., fasc. 2 (Panzer, Fn. Germ., fasc. 132), n. 3. Cuv., Règne anim., ed. Voigt., IV, 408, n. 10.
An Chernes oblongus Menge? cf. Menge, Chernet., 40.

† **depressus** Koch, Arachn., x, 57, t. 342, f. 792. Europe.

† **Ehrenbergii** Koch u. Berendt, Organ. Reste im Bernstein, II, i, 95, t. 10, f. 95. Fossil, Amber.

europaeus De Geer, Mém., VII, 355, t. 19, f. 14–15; ed. Goetze, VII, 138, t. 19, f. 14; Retz., Gen., 215.
= *Chelifer cancroides* L. (teste Koch.)

Fabricii Koch, Arachn., x, 50, t. 340, f. 786; Deutschl. Myriap., fasc. 2 (Panzer, Fn. Germ., fasc. 132), n. 4. Cuv., Règne anim., ed. Voigt., IV, 408, n. 11.
An Chernes oblongus Menge? cf. Menge, Chernet., 40.

fasciatus Leach, Trans. Linn. Soc. Lond., XI, 391, 1; Encycl., Brit., Suppl., I, 433, t. 22. = *Chelifer Geoffroyi* Leach.

fuscus Geoffr., Hist. abrég., II, 618, n. 1.
= *Chelifer cancroides* L.

† **Geoffroyi** Leach, Zoöl. Misc., III, 50, n. 4, t. 142, f. 1 (*an sexus*

alter Ch. Olfersii? teste Leach), Koch, Arachn., x, 56, t. 342, f. 791. Europe.

grandimanus Koch, Arachn., x, 38, t. 337, f. 778.
An Ch. cancroides L., *pullus?* cf. Menge, Chernet., 30.

granulatus Koch, Arachn., x, 37, t. 337, f. 777.
= *Ch. cancroides* L., cf. Menge, Chernet., 30.

Hahnii Koch, Arachn., x, 51, t. 340, f. 787.
An Chernes oblongus Menge? cf. Menge, Chernet., 40.

† **Hemprichii** Koch u. Berendt, Organ. Reste im Bernstein, II, i, 94, t. 10, f. 94. Menge, Chernet., 34, t. 4, f. 8. Fossil, Amber.

Hermanni Leach, Zöol. Misc., III, 49, n. 1, t. 142, f. 3. Cuv., Règne anim., ed. Voigt., IV, 407, n. 3.
= *Chelifer cancroides* L. (teste Koch.)

† **inaequalis** Curtis, Journ. R. Agric. Soc., 1849, x. England.

ischnocheles Herm., Apt., 118, n. 7, t. 6, f. 14; t. 5, f. 3.
= *Chthonius trombidioides* Latr. (teste Latr.)

ixoides Hahn, Arachn., II, 53, t. 60, f. 140. Koch, Arachn., x, 39, t. 338, f. 779; Deutschl. Myriap., fasc. 7 (Panzer, Fn. Germ., fasc. 140), n. 4. Cuv. Règne anim., ed. Voigt., IV, 408, n. 8.
An Ch. cancroides L? cf. Menge. Chernet., 30.

† **Kleemanni** Koch u. Berendt, Organ. Reste im Bernst., II, i, 95, t. 14, f. 143. Menge, Chernet., 34, t. 5, f. 9. Fossil, Amber.

Latreillii Leach, Zoöl. Misc., III, 49, n. 2, t. 142, f. 5 (*an sexus alter Ch. Hermanni?* teste Leach). Cuv., Règne anim., ed. Voigt, IV, 407, n. 4. = *Chelifer cancroides* L. (teste Koch.)

† **muricatus** Say, Journ. Acad. Philad., II, 63, 1. Hagen, Record Amer. Ent., 1868, 51. N. America.

museorum Leach, Zoöl. Misc., III, 50, n. 5, t. 142, f. 4. Koch, Arachn., x, 43, t. 338, f. 781.
= *Cheiridium museorum* Leach.

† **nepoides** Herm., Apt., 116, n. 2, t. 5, f. 9. Cuv., Règne anim., ed. Voigt., IV, 407, n. 6. DeThéis, 75, t. 3, f. 3. Europe.

oblongus Say, Journ. Acad. Philad., II, 64, 2.
= *Chernes oblongus* Say.

Olfersii Leach, Zoöl. Misc., III, 50, n. 3, t. 142, f. 2. Cuv. Règne anim., ed. Voigt., IV, 407, n. 5.
= *Chelifer Geoffroyi* Leach (teste Koch).

Panzeri Koch, Arachn., x, 44, t. 339, f. 782, f. 783 (pullus); Deutschl. Myriapod., fasc. 7 (Panzer, Fn. Germ., fasc. 140), n. 6.
An Chernes oblongus Menge? cf. Menge, Chernet., 40.

parasita Herm., Apt., 117, t. 7, f. 6. Cuv., Règne anim., ed. Voigt, IV, 408, n. 9. = *Chernes cimicoides* F. (teste Latr.)

† **pediculoides** Lucas, Expl. de l'Algér. Algeria.

Reussii Koch, Arachn., x, 48, t. 340, f. 785.
An Chernes oblongus Menge; cf. Menge, Chernet., 40).

† **rhododactylus** Menge, Chernet., 32, t. 4, f. 6. Danzig, Prussia.

ruber Geoffr., Hist. abrég., II, 618, n. 2, t. 20, f. 5.
= *Bdella rubra* Geoffr. (Acarus).

† **Schaefferi** Koch, Arachn., x, t. 341, f. 790. Europe.

† **Schrankii** Koch, Deutschl. Myriap., fasc. 7 (Panzer, Fn. Germ., fasc. 140), n. 3. Europe.

scorpioides Herm., Apt., 116, n. 3, t. 5, f. L. M. N. Cuv., Règne anim., ed. Voigt, IV, 407, n. 7. De Théis, 73, t. 3, f. 2.

† **sesamoides** Savigny, Descr. de l'Égypte, t. 8, f. 4. Egypt.

† **Sieboldii** Menge, Chernet., 35, t. 5, f. 10. Fossil, Amber.

trombidioides Latr., Gen. Crust., I, 133, n. 3; Hist. nat., VII, 142, n. 4. = *Chthonius trombidioides* Latr.

† **tuberculatus** Lucas, Expl. de l'Algér. Algeria.

Wideri Koch, Arachn., x, 47, t. 339, f. 784. F. Loew, Verhandl. zool. bot. Ges. Wien, XVI, 944. (Parasit. *Ulidia erythrophthalma.*)
An Chernes oblongus Menge? cf. Menge, Chernet., 40.

† **Wrightii** Hag., Record Amer. Ent., 1868, 52. Cuba.

CHELIGNATHUS Menge, 1854.

Koch u. Berendt, Org. Reste im Bernst., II, i, 97.
= *Chthonius* Koch

Kochii Menge, Koch u. Berendt, Organ. Reste im Bernstein, II, i, 97. = *Chthonius Kochii* Menge.

† CHERNES Menge, 1855.

Menge, Chernet., 39.

† **cimicoides** F., Menge, Chernet., 40, n. 2, t. 5, f. 15. Danzig, Prussia.
† **oblongus** Menge, Chernet., 39, n. 1, t. 5, f. 14; t. 1, f. 19; t. 2, f. 15; t. 3, f. 6, 13–15. Danzig, Prussia.
† **oblongus** Say, Hag., Record Amer. Entom., 1868, 51. N. America.
† **Sanborni** Hag., Record Amer. Entom., 1868, 51. N. America.
† **Wigandi** Menge, Berendt, Organ. Reste im Bernstein, II, i, 96; Chernet., 41, n. 3, t. 5, f. 16. Fossil, Amber.

CHERNETIDÆ Menge, 1855.

Menge, Neuest. Schrift. naturf. Gesell. Danzig, v, fasc. 2, 23. = *Pseudoscorpiones* Latr.

† CHTHONIUS Koch, 1843.

Menge, Chernet., 22.

† **Kochii** Menge, Chernet., 25, t. 4, f. 2. Fossil, Amber.
† **maculatus** Menge, Chernet., 23, n. 1, t. 4, f. 1; t. 1, f. 10–14; t. 3, f. 7. Danzig, Prussia.
An Chth. orthodactylus Leach? (teste Menge).
† **orthodactylus** Leach, Koch, Arachn., x, 79, t. 347, 808. Europe.
† **pennsylvanicus** Hag., Record Amer. Ent., 1868, 52. Philadelphia.
trombidioides Koch, Arachn., x. 76, t. 347, f. 806, f. 807 (variet.) *An Chth. orthodactylus* Leach, (pullus? teste Menge).

DICHELA Menge, 1854.

Menge, Koch u. Berendt, Organ. Reste im Bernstein, II, i, 96. = *Chelifer* Geoffr.; cf. Menge, Chernet., 33.

Berendtii Menge, Koch u. Berendt, Organ. Reste im Bernstein, II, i, 96. = *Chelifer Berendtii* Menge.

† EUCARPUS Dalmann, 1825.

Vetensk. Akad. Handl. Stockholm, XLVI. (Genus novum; in Gummi Animé or Copal.)

† MICROLABIS Corda, 1839.

Verhdl. Gesell. vaterl. Mus. Boehmen, 1839, 14.

† **Sternbergii** Corda, Verhdl. Gesell. Vaterl. Mus. Boehmen, 1859, 15, t. 1, f. 1–5. Fossil, Bohemia.

† OBISIUM Illiger, 1798.

Leach, Trans. Linn. Soc. Lond., XI, 390; Zoöl. Misc., III, 51. Latr., Famil. nat., 305. Menge, Chernet., 26. De Théis, Ann. sc. nat., XXVII, 63.

† **Beauvoisii** Descr. de l'Égypte, Arachn, t. 8, f. 6. Cuv., Règne anim., ed. Voigt, IV, 409. Egypt.

† **brunneum** Hag., Record Amer. Ent., 1868, 52. N. America.

† **corticale** Hahn, Arachn., f. 154. Cuv., Règne anim., ed. Voigt, IV, 409, n. 16. Europe.

cancroides Walcken., Faun. Paris., II, 253, n. 2.
= *Chelifer cancroides* L. (teste Latr.)

carcinoides Koch, Arachn., X, 65, t. 344, f. 798, mas. Cuv., Règne anim., ed. Voigt, IV, 409, n. 13. DeThéis, 68, t. 2, f. 1.
An O. dumicola Koch, variet? Koch, ibid., 67. *an O. sylvaticum* Koch, variet? cf. Menge, Chernet., 28.

dubium Koch, Arachn., X, 75, t. 346, f. 805.
An O. sylvaticum, pullus, Koch, ibid.; *an C. sylvaticum* Koch, variet? cf. Menge, Chernet., 28.

dumicola Koch, Arachn., X, 64, t. 344, f. 797; Deutschl. Myriap., fasc. 2 (Panz., Fn. Germ., fasc. 132), n. 2. Cuv., Règne anim., ed. Voigt, IV, 409, n. 17.
An Ob. sylvaticum Koch, var.? cf. Menge, Chernet., 28.

elimatum Koch, Arachn., x, 71, t. 345, f. 801, mas., f. 802, pullus.

An Ob. sylvaticum Koch, variet.? cf. Menge, Chernet., 28.

fuscimanum Koch, Arachn., x, 63, t. 343, f, 796.

= *Ob. sylvaticum* Koch, cf. Menge, Chernet., 28.

† **gracile** Koch, Arachn., x, 73, t. 346, f. 803, mas; f. 804, fem. Europe.

† **ischnocheles** DeThéis, 63, t. 1, f. 3. Europe.

† **maritimum** Leach, Zoöl. Misc., III, 52, t. 141, f. 1. Cuv., Règne anim., ed. Voigt, IV, 409, n. 15. Europe.

muscorum Leach, Zoöl. Misc., III, 51, n. 2, t. 141, f. 3. Koch, Arachn., x, 67, t. 344, f. 799. Cuv., Règne anim., ed. Voigt, IV, 409. n. 14. DeThéis, 66, t. 1, f. 4.

An Ob. sylvaticum Koch, var.? cf. Menge, Chernet., 28.

nemorale Koch, Uebersicht d. Arachn. Syst., II; Arachn., x, 67.

=*Obisium carcinoides* (teste Koch).

† **pallipes** Lucas, Explor. de l'Algér. Algeria.

orthodactylum Leach, Zoöl. Misc., III, 51, n. 1, t. 141, f. 2. Cuv., Règne anim., ed. Voigt, IV, 409, n. 12. Tulk., Ann. Nat. Hist., 1844, XIII, 55. = *Chthonius orthodactylus* Leach.

† **pusio** Kolen., Bull. Mosc., 1857, II, 430. Calcutta.

Rathkii Koch u. Berendt, Organ. Reste im Bernstein, II, i, 96, t. 10, f. 96. Menge, Chernet., 28, n. 2, t. 4, f. 4.

= *Chelifer Kleemanni* Koch, pullus, cf. Menge, Chernet., 29.

† **Sieboldtii** Menge, Berendt, Organ. Reste im Bernstein, II, i. 97. Fossil, Amber.

† **sylvaticum** Koch, Arachn., x, 61, t. 343, f. 794, mas.; f. 795, fem.; Deutschl. Myriap., fasc. 2 (Panzer, Fn. Germ., fasc. 132), n. 1. Cuv., Règne anim., ed. Voigt, IV, 410, n. 18. Menge, Chernet., 26, n. 1, t. 4, f. 3; t. 1, f. 4, 9, 16, 17, 20–23; t. 2, f. 4; t. 3, f. 3. Europe.

tenellum Koch, Arachn., x, 69, t. 45, f. 800. *an O. muscorum* mas., var? Koch, ibid, 70. *an Obis. sylvaticum* Koch, variet? cf. Menge, Chernet., 28.

trombidioides Latr., Leach, Trans. Linn. Soc. Lond., XI, 391, n. 1; Encycl. Brit., Suppl., I, 433, t. 23.
= *Obisium orthodactylum* Leach (teste Leach).

† **Walckenaerii** DeThéis, Ann. sc. nat., XXVII, 69, t. 2, f. 2. Europe.

† PELORUS Koch, 1843.

Koch, Arachn., X.

† **rufimanus** Koch, Arachn., X, 59, t. 342, f. 793. Brazil.

PHALANGIUM.

acaroides Montagu, Trans. Linn. Soc. Lond., XI, 7, t. 2, f. 4.
= *Phalangium truncatum* Montagu.

acaroides L., Syst. Nat., ed. XII, 1028, n. 5. Turton, Linn., III, 717. = *Chelifer americanus*.

cancroides L., Fn. Suec., ed. II, n. 1968; Syst. Nat., ed. XII, 1028, n. 4; ed. XIII, Gmelin, 2944, n. 4. Villers, Entom., IV, 82, n. 4, t. 11, f. 7. Mueller, Prodrom. Fn. Dan., 192, n. 1293. Schæff., Element., t. 38. Scopoli, Ent. Carn., 1067. Schrank, Enum. Ins., 525, n. 1090. Poda, Mus. Graec., 122. Swammerdam, Bibl. Nat., 35. Pallas, Spicil., IX, 29. Roesel., Insecten Belust., III, 366–370, t. 64, f. 1–6. Gleichen, Supplem. neuest. Entdeck., t. 8. Clerck, Aran. Suec., t. 6, f. 10, 2. Bonnet, Insectol. ed. Goetze, 352. Scaliger, Exercit., CXVI. Wolphius, ed. C. Gesner, 3. Meinecke, Naturforscher, Stk. III, 77. Schæff., Icon. Ins., II, t. 134. Cuv., Tableau élém. de l'hist. nat.; Adams, Microsc., ed. Kanmacher. = *Chelifer cancroides* L.

truncatum Montagu, Trans. Linn. Soc. Lond., XI, 10.
= *Obisium trombidioides* Latr., (teste Leach).

† PSEUDOSCORPIO Latreille, 1817.

Cuvier, Règne anim., VII.

POLYMEROSOMATA Leach, 1815. (Ordo.)

Leach, Trans. Linn. Soc. Lond., XI, 390.

SCORPIO.

Aristoteles, Hist. Anim., IV, cap. 7. Aldrovand., de Anim. Insect., 3, 227.

acaroides F., Spec. Ins., I, 552, n. 8; Mant., Ins. I, 348, n. 8; Syst. Ent., II, 437, n. 11. = *Chelifer americanus* De Geer.
araneus L., Iter Oeland, 84. = (?)
cancroides L., F., Syst. Ent., 400, n. 7; Spec. Ins., I, 551, n. 7; Mant., Ins. I, 348, n. 8; Ent. Syst., II, 436, n. 10. Panzer, Fn. Germ., fasc. 50, f. 14. = *Chelifer cancroides* L.
cimicoides F., Ent. Syst., II, 436. = *Chernes cimicoides* F. (teste Menge.)

SCORPIONIDEA Leach, 1817. (Familia.)

Leach, Zoöl. Miscell., III, 48.

SCORPIONIDES Latreille, 1806. (Familia.)

Leach, Trans. Linn. Soc. Lond., XI, 390. Latr., Gen. Crust., I, 132.

Dr. Hagen stated that Dr. A. S. Packard, Jr., had recently discovered in Brunswick, Me., and in Salem, a species of *Amphientomum*, a genus of Neuroptera, whose body is covered with scales, and heretofore known only from Ceylon.

The following paper was read: —

ON THE SYNONYMY OF THECLA CALANUS. BY SAMUEL H. SCUDDER.

In Eastern North America there are two species of Thecla, closely allied, occupying, so far as we know, the same geographical area (from Canada to Virginia or Georgia, and from Massachusetts to Iowa), and, until recently, almost invariably confounded by American entomologists. Messrs. Grote and Robinson first called public attention to the fact of their specific distinctness, although Mr. W. Saunders, both in his correspondence and MSS., had previously urged the same point. As my material was insufficient, and because certain specimens, to which I had constant access, seemed to combine many of the features which generally separated the specimens into two groups, I have hitherto been unwilling to accept the determination of these entomologists. But recently, through the kindness of many friends, I have had the opportunity of examining more than one hundred specimens of each species, and have become entirely convinced of their specific value.

The most prominent points of distinction between the two species are to be found in the general tint of the upper and under surfaces of the wings, in the presence or absence of orange spots near the anal angle of the upper surface of the secondaries, and in the nature of the extra-mesial band upon the under surface.

In one the general color of the upper surface of the wings is a very dark glossy brown; in the other dark greyish slate brown. The tint of the under surface of the first is dark slate brown; of the second ashy slate brown. The orange spots near the anal angle of the secondaries of the first are frequently present in the ♀ (in about one half of my specimens), almost never in the ♂ (about one in seventeen specimens); in the second they are almost always present in the ♀ (in about six out of seven), usually in the ♂ (about twice out of three times); these figures apply, in both cases, to those specimens which have any trace whatever of the spots; when they are distinct in the lower median interspace of the second species, there is almost invariably a pretty distinct, similarly colored spot in the next lower interspace, which is seldom the case in the first species. But it is in the character of the extra mesial band of the under surface that we find the most striking differences between the two species; in the first, the band consists of a series of quadrate spots slightly darker than the tint of the wing, bordered externally with pale bluish scales, and frequently (♀) or almost never (♂) bordered very faintly on the inner side; in the primaries the spots composing the band are usually confluent throughout the whole of their breadth; in the upper half of the secondaries they are generally placed successively a little farther toward the outer border, and are connected by but about one half their breadth; yet even here there is no white edging above or beneath; in the second species the spots composing the band are usually blackish brown in color, roundish oval and transverse, but sometimes—especially on the lower half of the primaries—quadrate or reniform in shape; they are independent, though closely contiguous, and in rare cases, partially confluent, and are completely encircled with whitish scales, although much more distinctly on the outer side than elsewhere.

There are also other differences of less importance; such as the presence, in the second species, of a broad and long, curving patch of orange on the under surface of the secondaries, next the inner margin and just above the anal angle; when this is at all perceptible in the first species, it is indicated only as a slender streak, often much

obscured by blackish scales. Another feature is in the sexual spot on the primaries of the male; in the first species this is rounded obovate, scarcely twice as long as broad, slightly darker than the ground color of the wing; in the second, it is oblong obovate, three times as long as broad, obscure dark greyish fuscous.

To the former species Messrs. Grote and Robinson, in their first discussion of the species, apply the name of *Thecla Falacer* God. and Boisd. and Lec.; and to the latter that of *T. calanus* (Hübn.). In a subsequent paper they claim that *Falacer* God. and *calanus* Hübn. are the same species, so that the former name must be dropped; and that the first species, formerly considered by them as *Falacer*, is undescribed; they therefore characterize it under the name of *T. inorata*; they also come to the conclusion that, under the name of *Falacer*, Boisduval and LeConte have described *Falacer* and figured *inorata*. "It seems to us," say these authors, "that *T. calanus* and *T. Falacer* [*inorata*] are distinct species, the former to be distinguished by its paler, more brownish color above, and by the fulvous marks of the upper surface of secondaries near anal angle." And again: "From this latter species [*calanus*] *T. inorata* differs by its smaller size, its more blackish color, darker fringes and the absence of the orange lunule on the upper surface of secondaries before anal angle." No mention is made of any trenchant mark of distinction drawn from the discal band of the under surface; we have seen, however, that this forms one of the most important points of separation, while the presence or absence of the colored spot near the anal angle of the secondaries above is but of relative importance, from its want of uniformity.

It is probably owing to this fact that these authors have fallen into the error of supposing that the second of the species which we have briefly characterized above has been figured by Hübner and described by Godart. The very reverse is the fact; and while the first of these species has been described in full, or figured no less than three times under as many different names, the second is yet undescribed, excepting by the short comparative phrases which we have just used, and by Messrs. Grote and Robinson, as quoted above. I propose, therefore, that the latter shall retain the name of *T. Edwardsii*, suggested for it by Mr. Saunders, who probably first recognized its title to independence.

If we examine the illustrations of Hübner in detail, we shall find that his representation of the color of the upper surface of the wings is

not exactly like that of either of the species in question, although it more nearly resembles *calanus*; the color of the under surface in no way resembles that of *Edwardsii*, and is precisely the same as *calanus*; a small orange spot painted near the anal angle of the upper surface of the secondaries in both sexes, occurs more frequently in *Edwardsii*, but is by no means absent from *calanus*; the mesial band consists of a continuous series of quadrate spots, whose connection is so close as to be generally indistinguishable (an unfailing mark of *calanus*), but edged with white scales on the inner side, as distinctly as on the outside, excepting on the primaries of the male—which rarely or never happens in either species, and in one no more frequently than in the other; this sexual distinction is, however, that of *calanus*; the orange lunule of the under surface is given rather as it usually occurs in *Edwardsii* than as in *calanus*, but is not very uncommon in the latter; and finally the sexual patch on the upper surface of the primaries of the male is as in *calanus*. That the extent of the coloring is faulty is shown by several features in which it exaggerates either species, and only when doing so does it approach *Edwardsii* rather than *calanus*; in all features of pure delineation it resembles only *calanus*, so that there can be no possible doubt that Grote and Robinson's *inorata* is the same as Hübner's *calanus*.

Laying as they do, too exclusive stress upon the presence or absence of the orange patch near the anal angle of the upper surface of the secondaries, they have also come to an erroneous conclusion concerning Boisduval and LeConte's plate, which, bad as it is, can certainly only represent *calanus*.

The specimens in the Harris Cabinet all belong to *Edwardsii*.

The synonymy of the two species will then be as follows :—

Thecla calanus (Hübn.) Westw.

Rusticus armatus calanus Hübn., Samml. exot. Schmett., I, Lep. I, Pap. II, Gent. I, Rustici, C. Armati, b. figs. 1–4.

Thecla Falacer God., Encycl. méth., IX, 600, 633. Boisd. et Lec., Lép. Am. Sept., X, 92–94, pl. XXIX, figs. 1–5. Morris, Cat. Lep. N. Amer., 11; Ib., Syn. Lep. N. Amer., 95. Scudd., pars, Proc. Ess. Inst., III, 164; Ib., Proc. Bost. Soc. Nat. Hist., XI, 378; Ib., Trans. Chic. Acad. Sc. I, 331. Grote and Rob., Trans. Am. Ent. Soc., I, 172–3; Ib., Descr. Amer. Lep., II, 2–3.

Thecla calanus Westw. and Hewits., Gen. Diurn. Lep., II, 486. Weid., Proc. Ent. Soc. Philad., II, 534; Ib., Cat. N. Am. Butt., 34.

Thecla inorata Grote and Rob., Trans. Am. Ent. Soc., I, 323–4; Ib., Descr. Amer. Lep., III, 1–2. Saund., Can. Entom., II, 61–64.

Thecla Edwardsii Saund., MS.[1]

Thecla Falacer Harr., Treat. Ins. inj. Veg., Ed. 1862, 276. Scudd., pars, Proc. Ess. Inst., III, 164; Ib., Proc. Bost. Soc. Nat. Hist., XI, 378; Ib., Trans. Chic. Acad. Science, I, 331.

Thecla calanus Grote and Rob., Trans. Am. Ent. Soc., I, 172–3, 324; Ib., Descr. Amer. Lep., II, 2–3; III, 2.

Mr. S. H. Scudder also called the attention of the members to the recent recognition of two distinct forms of Grapta among the northern specimens in our cabinets, which had formerly been labelled *G. interrogationis* Fabr.

Mr. J. A. Lintner, in a recent paper in the Transactions of the American Entomological Society, has separated the species having the upper surface of the secondaries obscured with blackish, under the name of *G. umbrosa*; but Mr. W. H. Edwards informs me that, in a paper recently presented to the same Society, he has shown — and I think rightly — that the name of *interrogationis* should be retained for the darker form, and has proposed that of *G. Fabricii* for the species which Mr. Lintner considers *interrogationis.* Neither of these writers, however, seems to have examined specimens of the southern species with dusky secondaries, figured by Cramer and by Abbot and Smith under the name of *C aureum*, and by later writers included as a synonym of *interrogationis.* As Linné's original description of *C aureum* referred to a Chinese species, the name of *G. Crameri* is proposed for this southern form.

April 6, 1870.

Vice President, Dr. C. T. Jackson, in the chair. Forty five persons present.

Mr. L. S. Richards of Quincy, Mr. Otis Pettee of Newton, Mr. Charles Barnard of West Newton, Drs. Clarence J. Blake and E. A. Perkins and Messrs. Charles E. Avery, Francis E.

[1] See Trans. Am. Ent. Soc., I, 172. Can. Entom., I, 98, 99.

Everett, Arthur M. Knapp, Charles F. Lynch, Charles C. Smith, Charles A. Wellington, David Whiton and Charles G. Wood, of Boston, were elected Resident Members.

The Vice President announced that the next course of Lectures under the auspices of the Society, would be delivered by Mr. Francis G. Sanborn, on four successive Monday evenings, commencing April 25th; the subject would be "Familiar Talks about Insects."

Section of Microscopy. April 13, 1870.

Dr. B. Joy Jeffries in the chair. Five persons present.

Messrs. W. H. Niles and Edward Burgess were elected Members of the Section.

Mr. W. F. Whitney described the structure of the hairs borne by the seed of *Tillandsia usneoides*; these are covered with points or barbs, directed toward the seed, formed by projections of the wall of the cells composing the hairs, which, catching on passing bodies, insure a wide distribution of the plant. Mr. Whitney also remarked that he had detected the presence of raphides in this plant, which, being a true epiphyte, must have obtained from the air the mineral matter to form these crystals.

April 20, 1870.

Vice President, Dr. C. T. Jackson, in the chair. Fifty three persons present.

The following paper was read:—

Note on the Glacial Moraines of the Charles River Valley, near Watertown. By N. S. Shaler.

I have already endeavored to establish the succession of events during the last glacial period, by a study of the remains of the detri-

tal accumulations then formed in the neighborhood of Boston. The order of the changes, as developed in this examination, seems to have been, first, the accumulation of an ice sheet, so deep as to move over all the summits in Southern New England; second, a subsidence of the land to the depth of from one hundred to one hundred and twenty feet below its present position, accompanied, or succeeded, by a rapid melting of the glacial envelope, leaving behind it a confused mass of stones of various sizes, sand and mud commingled together without distinct stratification, this sheet varying in thickness from a few feet on the summits of the hills to one or two hundred feet at the mouths of the valleys of the Charles and the Mystic; third, an elevation of the land which restored it to almost its present level, possibly to a point a little above the level it now has.

After the disappearance of the great glacial sheet, the shore remained depressed for a sufficiently long time to allow the tidal currents of the coast to wear away a large part of the unstratified deposit from the ice, reopening the fiords and river valleys which had been to a great extent clogged with this debris. Inasmuch as the actual amount of the work done by these marine currents is progressively greater and greater, as we pass from the uppermost points where its action is visible, down to the present level of the sea, we may conclude that it is likely that this shore began to rise immediately on the retreat of the glacier, and came slowly towards its present position.

Hitherto I have seen but few evidences of the existence of true moraines in the New England drift. Most of my study of the phenomena was done before I had ever seen glaciers at work, or had examined the evidences of their former action in the valleys of regions where all the drift material is attributable to their work. Without this practical knowledge it is really impossible to interpret the work done during the glacial period. Within the last two years, with the preparation of a year's study of the glacial phenomena of Switzerland, I have been able to recognize at sundry points some features which looked like true terminal moraines; but these are generally so far modified by the action of subsequent erosion, which has gone on in the valley where they are found, that their true character has not been clearly apparent. A few days ago, however, I found in the valley of the Charles, near Watertown, a mass of drift material disposed in the most unmistakable moraine shape. The ridge of the moraine may be traced from a point a few hundred feet from the north bank of the river at the eastern end of the United States Arsenal grounds

at Watertown, in a nearly north course of about a quarter of a mile. For the first two hundred yards of its course, its form is quite remarkable, separating it distinctly from the usual ridges of drift material found in this vicinity. It stands on the alluvial plain of the river like a fragment of a great dam, having a height of about twenty five feet, and a breadth of about one hundred. Following it in its northward course, it gradually becomes less distinct as it comes out of the valley of the river, and little by little fades away. Having been plowed over for nearly two centuries, the northward extremity is no longer clearly marked.

There are three sections visible in the moraine; one at its northern extremity, another where a water gap traverses the rampart, another where it is cut by the Watertown Railroad. At each point it is evident that the structure of the mass is that of all true moraines: stones of varied dimensions mingled together with a certain admixture of clay and sand make up the mass, which seems entirely without stratification. The general character of the material differs markedly from that of the drift found on Somerville Hill, or in any other of the *massive* glacial deposits. It is much less compact, the fragments are more angular and of much less varied mineral composition; fragments of slate rock greatly preponderate in the mass, being much more numerous than in any of the other drift deposits of this vicinity, unless it be in the other moraines of the same valley.

The relation of this rampart to the other beds of the valley, seems to indicate that it must have been formed after the close of the first division of the ice time, later indeed than the commencement of the reëlevation of the land. The ice stream does not seem to have risen to a great height on the sides of the valley, as the moraine does not extend more than fifty feet above the high water mark.

On the south side of the river there is visible what seems to have been a continuation of this moraine, or possibly a lateral moraine formed at the same time. I am not quite sure, however, of its real relations to that just described.

It is with much hesitation that I pronounce upon the character of this ridge of drift. I can say, however, that outside of the Alps I have never seen anything as clearly referable to the forces which build terminal moraines, and that in Switzerland no geologist would hesitate an instant to refer it to this group of glacial deposits.

Mr. W. H. Niles thought that there were certain features in the topography and surface-geology of the region spoken of which it would be difficult to reconcile with a terminal moraine located as described by Prof. Shaler.

In Watertown, not far from the locality mentioned, stratified sands and gravels occur at a higher level. These are frequently obliquely bedded with marked evidences of shallow water and strong currents. He believed these beds to be later Post-tertiary deposits. Such facts would show that in the latter portion of the Post-tertiary, currents of water must have acted with considerable power at this higher level.

Furthermore, in the vicinity of Boston there are unmistakable evidences of aqueous erosion at lower levels, corresponding with the level of the locality in question. He spoke of some of the features to be observed on Winter Hill, Somerville. About the upper portion of the hill the slopes are quite regularly curved, and the underlying slate rock is smoothed and finely striated. Descending the slope towards Mystic River, the striæ disappear and the surface becomes irregular. He regarded these facts as clear evidence that, subsequent to the glaciation which gave the form and the striated surface of the upper portion of the hill, currents had so eroded the lower portion of the slope as to cause the irregularity of surface. That, since the glacial epoch, aqueous agencies have extensively rearranged the surface materials in more elevated situations, as well as at the same level with said locality, is quite evident. He argued that it would be difficult to account for so perfect a preservation of a terminal moraine in the locality specified, while the even more substantial portions of the region were so extensively modified.

The following changes in the Constitution and By-Laws were adopted: —

CONSTITUTION.

Article V to be altered so as to read —

The officers of the Society shall be a President; two Vice Presidents; a Corresponding Secretary; a Recording Secretary; a Treasurer; a Librarian; a Custodian; and a Committee of three on each department of the Museum; who, together, shall form a Board for the management of the concerns of the Society, and be called the Council.

BY-LAWS.

Section II, Article VII, to be altered so as to read —

The Custodian shall be a person of acknowledged scientific attainments. He shall have general charge of the building and its contents; shall have free access to all the collections at all times; and shall act in concert with the Committees, to whom he shall bear the relation of adviser and assistant. In case of the absence or neglect of the Committees, he shall act in their stead, and perform their duties. He shall prepare and read at the annual meeting a report of the state of the Museum, compiled from the special reports made to him by the Committees. He shall keep a book to be called the Donation Book, in which shall be recorded, under their respective departments, all donations to the Museum, with the date and name of donor. And he shall perform such other duties as may be prescribed by the Council and mutually assented to.

Section II, Article VIII, to be altered so as to read —

The Committees shall be entrusted with the care of the Museum. They shall be designated for particular departments at the time of their election; they shall consist of not more than three members, one of whom shall be nominated to the Society by the Nominating Committee to act as Chairman in each Department; they shall, as soon as possible after a donation is made or specimens received, deposit them in their respective cabinets; shall arrange the specimens in their appropriate departments according to some system approved by the Custodian; and, so far as is practicable, label them with the names they bear in such system. They shall also, as far as is practicable, keep a correct catalogue of articles in their care, and shall be authorized to select duplicate specimens from the cabinet, and, with the assent of the Custodian, effect exchanges therewith. Each Committee shall make a written report to the Custodian, a month previous to the annual meeting, concerning the collection under its charge: the additions made during the year, and the important deficiencies which exist.

Section V, Article II, to be altered so as to read —

No specimens shall be removed from the Museum, without the leave of the Custodian and the Chairman of the Committee of the department to which they belong, who shall take a receipt for the same, and be responsible for their restoration in good order.

The title of Section VI to be altered so as to read "Of Committees of the Council."

Section VIII, Article I, to be altered so as to read —

A meeting shall be held on the first Wednesday in May annually, for the choice of officers and other general purposes. At this meeting an annual report, embodying the several reports of the Committees and Librarian, shall be read by the Custodian; and a report on the state of the funds by the Treasurer, who shall also present an estimate of the necessary expenses of the ensuing year.

Section of Entomology. April 27, 1870.

Mr. C. S. Minot in the chair. Eight members present.

The following paper was presented: —

On Asymmetry in the Appendages of Hexapod Insects, especially as illustrated in the Lepidopterous Genus Nisoniades. By Samuel H. Scudder and Edward Burgess.

A conspicuous feature in the structure of the higher animals is their bilateral symmetry — the tendency of the organs and frame work to exact reverse repetition upon either side of a longitudinal axis.

This bilaterality is also shared to a certain extent by some of the lower animals, and is generally more noticeable in the external configuration of the body than in the internal organs; it is apparent, not only in those portions of the body which are disposed in pairs, but also in the central organs, the opposite sides of which repeat each other inversely.

In the lower animals the exceptions to the law of bilateral symmetry are frequent and conspicuous, the shells as well as the bodies of mollusks often affording striking examples. Among the higher animals, at least in the exterior sculpture of the body, cases of absolute asymmetry are rare; the most prominent instance occurs in the mature flounders; others are well known, such as the very unequal development of the tusks of the narwhal, and the two sides of the

skull in many cetaceans. The crustacea, however, present numerous instances of asymmetrical development; for example, in the general form of *Bopyrus* and *Peltogaster*, and in the claws of many decapods.

We are not aware that any cases of asymmetry have been recorded among the worms; and certainly very few among insects; there are occasionally slight differences in the right and left mandibles of some mandibulates, and *Coccus* has recently been referred to by Gerstaecker[1] as an example of asymmetry, without further specification; we have been unable to discover to what he refers. Loew, also, in the first of his monographs of the North American Diptera, states that the hypopygium (the external genital armature) of the males of Syrphidæ and Pipunculidæ is unsymmetrical. We append a figure of this organ in an American species of *Phora*, closely allied to, if not identical with, *P. microcephala* Loew, in which the left clasp (c) is very much stouter and somewhat longer than the right one (c′); the drawing is magnified thirty five times.

In a recent study of the external genital organs of the males of butterflies, we chanced to examine those of certain native species of Nisoniades, and found not only a great difference between allied species, but a most remarkable asymmetry between opposite clasps of the same individual; this has led to an examination of all the North American species of which we could obtain specimens for dissection, and the results are embodied in this paper. The species have been found to be much more numerous than was anticipated; and yet we are aware of several others from distant parts of North America, which we have not been able to obtain; we trust that the new interest, which will hereafter attach to this otherwise inconspicuous group, will lead to important results.[2]

By referring to Fig. 15 of *N. tristis* Boisd., which we will use for illustration,[3] it will be seen that the clasps (15. R., 15. L.) in this genus are developed to an unusual degree, and exhibit more clearly than the central organ the prevailing asymmetry of the parts. With some minor exceptions, which will be specified below, the left clasp is always more highly developed than the right, both in the configuration of the whole, and in the sculpture and armature of the details; each clasp may be divided, for convenience of description,

[1] Bronn, Klassen u. Ordn. d. Thierreichs, v, 33.

[2] The same organs are asymmetrical in the closely allied genus *Achylodes*.

[3] This, and all the succeeding drawings, are magnified twenty diameters.

into two parts — an upper and a lower; the upper portion is ordinarily developed as a broad lobe (l), armed on its upper edge with a row of very long, stiff bristles, pointing backward, not exhibited in the drawings; it has a tendency to expand in two directions, forming what we have called the upper and hind processes (up, up′, hp, hp′), according to their position; the lobe is generally smaller in the left clasp than the right; and the hind process either wanting or minute upon the left. The lower part of the clasp is a very long, slender, usually compressed, often twisted and invariably curving blade (b, b′), frequently spined or pointed at tip, its origin marked below by a denticle; it bears, at the base of the upper edge, a short, frequently bent or curving process (p), ordinarily somewhat triangular in shape, and very often armed with spinules; sometimes (as in *N. tristis*) this process is wanting on the right clasp, and is usually more slender and frequently longer on the left than on the opposite side; at their base the clasps form a large, broad, compressed, somewhat gibbous plate.

The upper organ, Fig. 15. U, is much more difficult to describe. It varies exceedingly in shape, so that one has to examine the parts carefully, and through a considerable series to determine with certainty the homologous areas. It also differs much in size, in which particular it appears to bear an inverse ratio to the dimensions of the clasps. In general, it may be said to consist of a gibbous, subovoid main body, contracted toward the tip, and bearing at the extremity a pair of hooks, (h, h′), occasionally consolidated at the inferior junction of which a minute, appressed, central plate, or tooth (t), dentiform on a side view, frequently depends; near the middle of the upper portion of the main body, the surface is either simply a little elevated, or expanded after elevation into nearly horizontal alations; or it rises into a dorsal, usually horse-shoe shaped crest (c), the sides of which sometimes form conspicuous lateral expansions (e, e′), the whole crest being frequently asymmetrical in elevation and lateral extension, and bearing on its upper edge, or surface, an armature of spines; from the middle of the upper surface, lateral arms (a, a′) extend downward and then curve backward, meeting behind, and at their united extremities expanding into a transverse, usually broad field, which we have termed the inferior armature (ia), well provided with spines or bristles.

The movement of the clasps is of course lateral, and that of the upper organ vertical; but some of the constituent parts of the latter

have an independent motion, the whole apical apparatus, including the hooks, having a common vertical movement upon the main body, and the central tooth a forward and backward swing upon the apical portion.

Besides the asymmetry of the dorsal crest, to which we have referred, the lateral arms, the terminal hooks and the inferior armature, (as will be seen in the hind view of the upper organ of *N. tristis*), frequently partake of the same peculiarity; indeed, this element seems to pervade every part of the remarkable genital armature in this genus, as a study of the following descriptions and illustrations, in which we pass from the simpler to the more complex form, will show.

One reason, doubtless, that this strange asymmetry has escaped observation, is the entire concealment of the parts by scales, and the want of attention to these appendages in butterflies; the upper organ is protected by an extensive posterior expansion of the terminal segment of the abdomen, which forms a projecting hood, and which is also provided at tip with a heavy fringe of excessively long scales; the clasps are themselves furnished externally with a heavy coating of pretty long scales, which effectually hides the sculpture of the parts; although the disparity in length of the two clasps is readily seen, when it is so marked as in *N. Brizo.*

In endeavoring to assign a reason for this excessive development and remarkable asymmetry of the external genital organs, one cannot but be struck by the fact that the males of this genus are far more commonly met with than the females; whether this is due to the comparative scarcity of the latter, or to the greater seclusion of their haunts—all the species are sylvan—we are not prepared to say; the females, however, are taken in the same stations as the males, and seem entirely at home there; so that we are inclined to adopt the former hypothesis and to believe that, notwithstanding the simplicity of the external genital apparatus in the female, the excessive development of these parts in the male is in correlation with their superior numbers, ensuring, beyond doubt, the impregnation of every female; we do not, however, see how asymmetry gives any superior advantage. It may be mentioned in this connection that when a male of one of these species is taken between the fingers, the insect frequently endeavors to use this apparatus as an organ of defence, or perhaps it might be said, of aggression, much after the manner of a *Panorpa* or a *Staphylinus.*

We have not hesitated to give names to the species described below for the first time, because the parts to which we have confined the descriptions are, certainly, in this sombre genus, the most characteristic; we believe that only those who confine their descriptions to the coloration of the wings will blame us; to them we would say that these descriptions are no more partial than their own, and are based upon features which admit of a better definition.[1] In assigning names we have followed the lead of earlier authors in recalling the Roman poets and satirists.

GROUP I.

Upper organ: crest wanting; terminal hooks separate, slender; tooth reduced to a tubercle and bristle. *Clasps:* blades slender; basal process unarmed.

Nisoniades Persius Scudder. Fig. 1.

Upper organ: Main body short, slender, high. Hooks very long and slender, tapering, slightly compressed, separate at base, basal halves divaricate, but beyond subparallel, curving inequally, the tip hooked downward, tapering rapidly and sharply pointed; from the middle of the ridge which unites their bases, a very minute denticle depends with a projecting bristle. Arms broad at their origin, made one half as small below by an excision of the posterior edge, directed downward and slightly forward, then bent at about a right angle backward, and very soon expanded to a common, very large, spatulate cup, opening upward, its outer half composing the inferior armature of delicate points, widely separate from the base of the terminal hooks.

Left clasp: Main body nearly triangular — the apex at the point of attachment — widening rapidly, a little curved longitudinally and slightly gibbous laterally. Blade very long and slender, the basal fourth rapidly narrowing, beyond nearly equal, depressed, curving inward, at first slightly, afterwards rapidly, so as to be subfalcate; otherwise nearly straight; tip produced to a sharp point; basal process consisting of a gibbous subreniform lobe, not half as long as the blade, constricted at the base, having a general backward direction, curved a little inward, its upper margin strongly arched, its lower excised, rounded at the tip, the basal portion of its lower margin bent inwards and forming a slight, sharp, inconspicuous ridge. Lobe large,

[1] Wherever possible, a large series of specimens has been examined, and we have found the amount of individual variation very small.

broad, uniform in width, as long as the basal process of the blade and twice as broad, directed backward, somewhat upward and a little inward, its outer surface turned slightly upward, its apex rounded and curved slightly inward.

Right clasp: Main body much as in the opposite clasp, but having a broad angle near the middle of the upper margin, beyond which it does not broaden; it is also more deeply excised on the lower margin, Blade as long as that of the left clasp, narrowed at the base and beyond depressed as there, but just beyond the middle it is bent slightly downward, and having its upper margin slightly angulated, or at least curved a little downward in the outer half; close to the tip the inner edge is angulated again, broadening the tip, which terminates in a rounded right angle; basal process consisting only of a small, triangular, rounded, backward prolongation at the extreme base of the upper edge of the blade. Lobe extremely broad and large, half as long as the blade, angulated in the middle of its lower margin, its upper half produced as a narrowing rounded plate, curved strongly over upon itself, the concealed margins armed with a few rather prominent spinules.

New England.

Nisoniades Lucilius Lintner MSS. Fig. 2.

Upper organ: Very similar to that of *N. Persius*, differing in being shorter, having shorter terminal hooks; a larger proportion of the cup, forming the union of the lateral arms, seems to be covered with the inferior armature, as it extends almost to the base of the bent portion of the arms.

Left clasp: Main body pretty small, slender, straight, slightly convex laterally, increasing rapidly and pretty regularly from the base, forming a high triangle, whose apex is at the base of the piece. Blade pretty broad at the base and directed a little downward, decreasing rapidly in size, and then uniformly slender, very long, curved backward, slightly upward and considerably and regularly inward, scarcely compressed, its outer surface twisted slightly in the apical half so as to become nearly horizontal and uppermost, very bluntly rounded at the tip, the upper inner angle a little produced; basal process digitate, attenuated, incurved, bowed upward, not compressed, slenderest at the base, rounded at tips, a little more than one third as long as the blade. Lobe forming a slightly longer, broad, nearly equal, flattened plate, a very little narrower and very broadly

rounded at the tip, curved slightly inward and twisted a very little, tending to bring the outer surface uppermost.

Right clasp: Main body like that of the opposite side. Blade similar in size, length, form and direction to the left clasp, but not so broad at the base, equally rounded at the tip and armed apically with a very few minute, inconspicuous spinules; basal process reduced to a slight pointed triangular tooth, connected with the blade by a slight ridge. Lobe very large and broad, reaching downward beyond the base of the blade, fully half as long as it, rounded at tip, directed backward and a little upward, gibbous, curved inward a little more than the blade, the tip bent suddenly upon itself and directed straight forward; the bent apex and incurved lower edge armed, the former with a few very long, the latter with more frequent shorter, minute spinules.

New England.

GROUP II.

Upper organ: crest scarcely elevated, with slight, horizontal, lateral expansions; terminal hooks consolidated, stout; tooth very large. *Clasp:* appendages well armed, very small when compared to main body.

Nisoniades Icelus Lintner MSS. Fig. 3.

Upper organ: Main body short, pretty high, not very slender. Dorsal crest consisting of a pair of very small, horizontal, lateral alations, the posterior angle of each rounded, the anterior produced laterally as a bluntly pointed triangle. Hooks forming a single, stout, slightly curving, pointed beak, directed backward, bearing beneath, just beyond the middle, an appressed, dentiform, backward curving appendage, which is provided, on the outer edges of its apex, with a pair of short, stout, divaricate thorns; on either side of the extreme base of the hook, its upper surface expands laterally to a very slight degree; and from the extreme base of its lower outer surface, an appressed, conical tooth projects downward and slightly outward. Arms broad at base, narrowing rapidly, directed downward and at the bottom bent at nearly right angles backward; they then curve backward, inward and upward, broadening slightly until they meet at some distance below the hook, bearing on the whole of the outer lower surface of the curving portion, the inferior armature of rather distant, comparatively large, short, blunt spines, largest at the most posterior point.

Left clasp: Main body very broad, increasing slightly in breadth from the base half way to the tip, nearly flat and straight, the upper edge produced and curved inward a little near the base, the lower edge a little full near the base. Blade straight, its lower edge continuous with the lower edge of the main body, slender, uniform, slightly compressed, not very long, armed at the apical half with minute, raised points, and terminating in a rounded point; basal process as broad as long, rounded, compressed, its hinder two thirds bent at right angles inwards and a little upwards, and armed along its whole edge and a portion of its upper surface with minute spinules. Lobe rounded, deeply and roundly excised on either side, of about the size of the basal process of the blade, but smooth; just in advance of it the upper edge of the main body is slightly prominent.

Right clasp: Main body similar to that of opposite side. Blade of the same length as that of the left clasp and otherwise similar, but curving very slightly inward and terminating in an unarmed slightly rounded point, a very little angulated at the tip; basal process developed as a dactylate apophysis, directed upward, nearly at right angles to the blade, compressed, but twisted at right angles, so as to appear depressed, a little broader than the blade, shorter by nearly one half, its tip broadly and regularly rounded, and armed with minute spinules. Lobe developed as a bluntly rounded, rather prominent plate in the middle of the upper half of the whole piece.

New England.

Nisoniades Brizo Westwood. Fig. 4.

Upper organ: Main body moderately slender, long and high, strongly arched; from the middle of the extreme posterior slope of the upper surface, a lateral, triangular, slightly curved plate or alation with rounded apex, arises on either side, projecting outward and a little upward, the anterior edge nearly at right angles with the median line of the main body, or even directed a little forward, and a little elevated. Hooks united into one extremely large beak, swollen beyond the middle, the tip pointed, the sides at base compressed and directed downward as small flaps; beyond the middle of the lower surface depends a very large, appressed tooth, the anterior edge nearly straight, the posterior curved sinuously forward, as seen from the side, broad and well rounded, the posterior surface having the edge emarginate, and furnished with a slight median ridge. Arms extremely broad at origin, tapering very rapidly in a downward direction, becoming slender before the lowest point is reached, and then

remaining of nearly the same size; below bent squarely at right angles backward, pursuing a straight horizontal course for half the distance to the tip, then curving inward and upward, expanding a little at the united tips, and bearing the inferior armature of minute raised points — not very distant from the pads at the base of the terminal hooks.

Left clasp: Main body large and gibbous, its base slender, broadening pretty regularly, nearly straight in projection. Blade broad at base, narrowing rather rapidly in the basal half, beyond pretty uniform, the tip rounded and thickened, but obliquely docked; basal process directed horizontally backward, bent or curved at base inwardly, twisted very slightly, with a tendency to bring the inner side uppermost; the whole upper edge is armed with minute recurved denticulations, extending as far as the tip, and on the apical third forming a double row of minuter teeth; the basal process is a rather small rounded lobe, whose general direction is upward, at right angles to the blade, curving a little inward, and having one edge a little concealed by the minute hind process of the lobe; its whole outer edge is covered by recurved denticulations, in continuation of those on the blade; the terminal portion of the outer surface is also minutely spinulate. Upper process of lobe directed upward, curved inward and thickened a little above, its edge showing indications of obsolete denticulations.

Right clasp: Main body similar to that of the opposite side, excepting that it is much broader at the base — nearly as broad as anywhere. Blade short, about half as long as the opposite clasp, broad, compressed, the basal half narrowing somewhat, the tip rounded and scarcely excised, the armature as on the opposite clasp; basal process similar to the opposite, but smaller and twisted, so that its inner surface is directed backward and a little inward, and this face, instead of the outer, is furnished with spinules; the border is armed as in the opposite piece, but the basal border is free from, although concealed by, the lobe. Each of the processes of the lobe is simple and broadly rounded, the hind scarcely the larger.

New England to Florida.

GROUP III.

Upper organ: crest as in Group II; hooks separate, moderate; tooth stout, conical. *Clasp:* blade stout, bent at right angles near the middle; right lobe dactylate.

Nisoniades Martialis Scudder. Fig. 5.

Upper organ: Main body long and slender, not elevated, unusually small; crest consisting of a pair of depressed, slightly curving, lateral expansions, nearly horizontal, the anterior angle produced as a small, narrow, rounded lobe, directed outward and slightly forward. Hooks short, moderately slender, slightly divergent, broadly separated at base, the main body at their extreme base expanding laterally in a ridge nearly or quite continuous with the lateral arms; tooth stout, conical, directed somewhat forward, terminating bluntly with a slightly elevated apical ridge. Arms slender, directed at first forward and slightly downward, then downward and slightly forward, finally bent abruptly at a right angle at the bottom, and continued backward to the inferior armature, which is borne upon its upward curved, slender limb, on either side of, and behind, the tooth.

Left clasp: Main body increasing rapidly in breadth from the base to the commencement of the lobe; transversely it is curved a little, longitudinally it is almost straight. Blade of nearly uniform width, elbowed just before the middle in an upward direction, and at the same time bent at an angle of about forty five degrees inward, the outer surface becoming uppermost, carrying with it the upper half of the basal portion of the blade; the apical third of the outer surface, and particularly the border and broadly rounded, faintly uncinated tip, armed with minute spinules or raised points; a minute tubercle shows the position of the basal process. The region of the lobe is marked by a distinct furrow running far toward the base of the main body; the lobe is of medium size, bent a little inward, with a slight sinuosity, and is rudely triangular; the basal portion of its upper border is a little swollen, its apical half slightly arched and thickened.

Right clasp: Main body similar to that of the left piece but slenderer. Blade compressed and tuberculate at the base of the lower edge like that of the left clasp, but having the upper edge slightly thickened and bent inwards; it is broad at base, narrows slightly and regularly for three fourths the distance to the apex, excepting a central, broad, scarcely elevated denticle on the upper edge; is there bent abruptly inward and slightly upward, then suddenly narrowed and terminates in a bluntly rounded point; this narrowed portion is armed like the tip of the opposite blade; basal process wanting. Lobe broad at the base, narrowing immediately, suddenly and extremely, and then developed into a somewhat compressed policiform process of nearly uniform size, parallel to the basal portion of the

blade, about as long as its terminal portion, ending in a thickened, bluntly rounded tip.

Northern States.

GROUP IV.

Upper organ: crest elevated as a gibbous protuberance, surmounted by prickles; terminal hooks separate, stout; tooth stout, conical on a side view. *Clasp:* basal process of left blade larger at the tip than at the base, scarcely longer than broad, directed upward; right lobe three times as broad as long.

Nisoniades Terentius nov. sp. Fig. 6.

Upper organ: Main body small, not very slender, short, not high. Crest protruding upward and a little backward into a plump, bulbous ridge, armed with minute points, and, when viewed from above, with a broad furrow a little upon one side of the middle; this may be due to shrinkage. Hooks very short, very stout, curved, bluntly pointed, widely separate at base, divaricate almost at right angles; from the middle of the ridge uniting their bases depends a short, rather small denticle, bluntly conical on a side view, very broadly obcordate on a hind view. Base of the lateral arms greatly produced in a posterior direction; otherwise directed downward, then bent at more than a right angle backward, the lower edge very soon expanding quite broadly, so as to meet the similar portion of the opposite one beneath, and bearing upon this united belt the inferior armature, which occupies with its minute raised points a very large and broad field, reaching nearly to the base of the terminal hooks.

Left clasp: Main body pretty broad, base obliquely and very largely docked above, upper margin deeply, broadly and roundly excised just before the lobe; transversely it is a little gibbous, and longitudinally a very little curved. Blade very long, compressed, its upper edge a little incurved, giving it a solid appearance, gradually twisted so as to bring the outer surface uppermost; it diminishes in size very gradually to the tip, curving very slightly inward in continuation of the curve of the main body; viewed laterally it is slightly sinuous in its course, the apex bent inwards nearly at a right angle, rapidly tapering, squarely docked and armed with very minute teeth at the tip; basal process directed upward and somewhat backward, bent also a little inward, especially by a twist of the hinder edge; it is small, slightly longer than broad, broader at tip than at base, its hinder edge straight and smooth, its front and upper edge rounded

and conspicuously armed with minute teeth, which are borne also, to some degree, upon the outer surface near the tip; at the base it is very closely connected with the lobe. Lobe forming a very broad and very short flap, directed upward and a little outward, its apex scarcely at all rounded, but the outer angle produced into a small, incurved, rounded pad.

Right clasp: Main body similar to that of the other side, with rather deeper excisions and more prominent projections. Blade exceedingly broad and short, its outer surface gibbous, especially near the apex, and twisted a little in its course so as to bring its outer surface somewhat upward, its curve the continuation of that of the main body, as on the opposite side, the lower edge directed a little upward with a sinuous curve, the upper edge curved upward, the apex broader than the bases, squarely docked, the lower angle rounded, the upper square, almost produced and armed with a few minute spinules beyond the central excision of the apical edge; basal process almost entirely concealed; it is a small, narrow, appressed, dentiform, bluntly pointed piece, directed almost straight inward from the base of the upper edge of the blade. Lobe exceedingly broad and very short, nearly twice the breadth of that of the opposite side, and having a similar direction, its apical border excised, the angles forming the upper and hind processes, the former well rounded, gibbous and incurved, the latter greatly produced as a prolonged flap, uniform in breadth, well rounded at apex, gibbous and bent strongly inward at right angles, crowding against and concealing the basal process of the blade, which it equals in length, and almost coming in contact with the blade itself.

Florida.

Nisoniades funeralis nov. sp. Fig. 7.

Upper organ: Main body pretty short, moderately arched, rather broad and high. Posterior extremity of upper surface broadly and bluntly protuberant in an upward, backward direction, and bearing upon its swollen summit a small, horseshoe-shaped, gibbous, elevated crest, opening forward and followed in that direction by a distinct furrow; the crest is completely covered with minute raised points. Hooks small, well rounded, compressed, pretty stout, sharply pointed, divaricate, separated pretty widely at their bases, and supporting there a depending appressed tooth, broader than long, its sides angulated, its otherwise angular tip slightly excised. Arms very small at base, expanding backward very extensively; directed straight down-

ward, then curved backward and inward at nearly a right angle, expanding at tip and on their united apices bearing the inferior armature,—a very large and broad field of raised points.

Left clasp: Main body rather slender, the upper portion of the obliquely docked base slightly full, and just beyond, anterior to the lobe, a little excised; lower edge a little curved; longitudinally almost straight, transversely a little gibbous. Blade directed backward and very slightly upward, long, compressed, slender, sinuous, regularly and slightly tapering, bent a little inward and curving slightly in the same direction; upper half of the outer surface bent strongly inward, especially on the basal half, the apex very slender, bent abruptly inward nearly at right angles, rounded and minutely serrulate at tip; basal process with its anterior edge nearly opposite the denticle on the lower edge of main body, marking the origin of the blade, and consisting of a compressed, slightly gibbous, spatulate, well rounded, almost sessile lobe, directed upward and a little backward, curving, especially the upper half, a very little inward, the upper half, at least, of the outer surface covered with short, blunt spinules; it is scarcely as long as the width of the blade just beyond it. Lobe very broad and very short, curving somewhat inward, rising abruptly from the upper edge of the main body, directed upward and backward, its anterior as long as its posterior margin, but the latter bent over inward at right angles, the broad apical margin nearly straight, the angles sharp.

Right clasp: Main body slender, a good deal like that of the opposite clasp, but more deeply excised. Blade very broad and less than half as long as that of the opposite side, gibbous, twisted so as to bring most of the outer surface nearly horizontal, curved inward, scarcely downward, of nearly uniform breadth throughout, the apex bluntly docked, its outer lower angle broadly rounded, its inner upper angle square, very minutely serrulate and curved a little downward; basal process mostly concealed from the outside, very peculiar, being formed of an appressed pinching of the inner, upper, basal surface of the blade, forming a small, transverse, rounded flap, slightly longer than broad, directed inward and upward, and armed at tip with long spinules. Lobe excessively broad and quite short, directed upward and somewhat backward and inward, transversely rather strongly curved, its outer angles broadly rounded and curved inward, its posterior border strongly rounded and produced, and a little shorter than the anterior, which is slightly excised; as viewed laterally, the

apical margin is nearly straight; in reality it is very broadly and regularly excised.

This Texan species resembles *N. tristis* of California in the white fringe to its wings.

Nisoniades Ovidius nov. sp. Fig. 8.

Upper organ: Very similar to that of *N. funeralis*, but differing from it in having the dorsal crest flattened above, thrust more backward, in having slenderer terminal hooks and the dependent, appressed denticle not so broad and more excised at tip.

Left clasp: Main body much as in *N. funeralis*, but slightly broader, the upper portion of the base not so full, and not followed by an excision. Blade directed backward and slightly upward, pretty long, compressed, moderately slender, regularly and slightly tapering, the apical half curving inward a little, the upper half at base, nearly the whole at tip, curving over gradually inward, the apical portion tapering rapidly by the excision of the lower edge, bent and twisted a little so as to be directed inward, considerably backward, and on its basal portion slightly upward, terminating in a somewhat blunted point, armed with minute serrulations; basal process consisting of a subspatulate, compressed lobe, half as long again as broad, directed upward and scarcely backward, curving over inward considerably, its apical border curved but slightly angulated on either side, and broadly bordered with minute, but not very fine spinules; it is about as long as the width of the blade just beyond, seen laterally. Lobe very broad and short, tapering very rapidly, apical margin straightly docked, anterior and posterior borders equal in length, but the posterior angle produced and broadly and abruptly bent over inward, so as to give the lobe the appearance of being directed backward more than upward.

Right clasp: Main body more slender than on the opposite side, resembling the left clasp, but pretty deeply excised previous to the lobe; blade very similar to that of *N. funeralis* but considerably shorter, yet of equal width, directed a little upward, bent more inward, the tip curved less inward, the outer surface not so strongly twisted; basal process quite similar to that of *N. funeralis.* Lobe almost as broad as in *N. funeralis* and otherwise similar, but the posterior margin is much more produced, the outer angle more prominent and incurved, and the apical margin, even on a side view, is conspicuously excised.

Florida.

GROUP V.

Upper organ: crest slightly elevated, and bearing a backward-facing, bristly shield, expanding above; hooks separate, moderately stout; tooth of moderate size. *Clasps:* basal process of left blade triangular, hind angle greatly produced; right lobe consisting of a long curving finger, directed backward.

Nisoniades Ennius nov. sp. Fig. 9.

Upper organ: Main body rather long and not high, nor greatly curved; posterior part of upper surface much elevated and bearing, near the extremity, a crest in the form of an appressed plate, facing backward and very slightly upward, narrow at base, rapidly and greatly expanding above, the outer angles sharp, the upper border arched, and bearing an extensive armature of slender clustered spinules, curving forward; anterior to it the upper surface has a distinct median furrow. Hooks very short and stout, compressed, bluntly pointed, divaricate, pretty widely distant at base, and bearing at their junction a pretty broad, very short and small, bilobed, appressed tooth. Arms of nearly uniform size, curving in all their course, having at first a general downward direction, then bent in a sharp, angular curve at less than a right angle, beyond which the limb is directed upward, backward and inward, and bears at the united tips the inferior armature, which is a very large and broad belt of raised points. The crest and arms are somewhat asymmetrical.

Left clasp: Main body pretty broad, irregularly gibbous, increasing rapidly in width from the base backward, the terminal edge squarely docked between the lobe and blade. Blade very long and slender, the outer surface facing upward and outward, curving slightly inward and upward, the upper edge with a median, broad, slight denticle, the apex rounded, its inner angle produced to a sharp point, bent inward and a little downward, armed with minute spinules; basal process subtriangular, attached by a narrow neck, one apex, with the smaller half, directed backward, its tip pointed and bent a little inward; the other apex, with the larger half, directed upward and a little forward, bent also strongly inward, and at the same time twisted so as to make the outer surface face a little backward; this part of the surface is armed with minute spinules and the tip is rounded. Lobe widely distant from the basal process of blade, quadrate in shape, nearly twice as broad as long, a little broadest at apex, directed backward and a little upward, curved also somewhat inward

and a little downward, the lower portion of apex a little produced, rather laterally than apically, but rounded.

Right clasp : Main body not broad, nearly equal, the upper portion of the base largely docked diagonally. Blade long and broad, directed somewhat upward, curved, especially near apex, a little inward, the outer surface twisted a very little upward; it is broadest in the middle and tapers beyond very gradually to a well rounded tip; basal process wanting. Lobe closely contiguous, and at base parallel to the blade, long and slender, directed a little upward, curved inward; the apical half tapers suddenly to a long and very slender, nearly equal, curving dactyl, directed a little downward and nearly straight inward, bluntly pointed and armed at the apex with some very minute spinules.

New England.

Nisoniades Juvenalis Westwood. Fig. 10.

Upper organ: Main body short and moderately high. Posterior part of upper surface not greatly elevated, bearing at the extremity an appressed, slightly sinuous plate, facing backward, comparatively narrow at base, immediately expanding greatly, so as to appear almost sessile; the outer angles, especially that upon the right side, are greatly produced and sharply pointed; the upper border is broadly arched and armed as in *N. Ennius*, and the median furrow is as in that species. Hooks short, very broad at base, bluntly pointed, triangular, depressed, inequally curved, divergent, distant at the base by the width of the tooth, which is so hidden in the only specimen we have been able to examine that it cannot be described without injury. Arms much as in *Ennius*, but slenderer, bearing at their united tips a broad belt of raised points — the inferior armature.

Left clasp: Similar to that of *N. Ennius*, but differing from it in the following particulars: the upper margin of the main body has a slight sharp tubercle just previous to the lobe, indicated in *N. Ennius* only by a scarcely noticeable elevation. Basal half of the blade fully as broad as that of *N. Ennius*, while beyond the median denticle the upper edge is considerably narrowed by a broad rounded excision, making this portion slenderer than in *N. Ennius*, and scarcely more than one third as broad as the basal portion; the apex is much more produced and very finely pointed, and the denticulations more distinct; the basal process differs only in having the hinder portion produced to a greater length and more slender, being nearly one third the length of the inner margin of the blade; while in *N. En-*

nius it is scarcely one fifth of the same. The lobe differs in being much broader at the tip — one half as broad again as the base — and in being less curved inward.

Right clasp: The blade differs from that of *N. Ennius* in being generally broader and in tapering only from beyond the middle of the apical half. The lobe is similar but rather broader on the basal half; the apical half is also much broader — twice as broad as in *N. Ennius*, and more than one half as broad as the base of the lobe — and subspatulate in shape, broadly rounded at the tip.

Southern States.

GROUP VI.

Upper organ: Crest elevated and surmounted by a horseshoe-shaped, infundibuliform, spiculiferous ridge; hooks separate, large and rather stout; tooth as in Group IV. *Clasps:* Basal process of left blade consisting of a long and slender finger parallel to the blade, armed at apex and sometimes on upper edge; upper and hind process of left lobe prominently developed.

Nisoniades Propertius nov. sp. Fig. 11.

Upper organ: Main body rather short, high and slender. Posterior extremity greatly elevated, the crest forming a half funnel-shaped, appressed and gibbous, transverse plate, facing backward and a little upward, and armed with little spicules, which on the margin become very long curving bristles; anteriorly it is supported on either side by a thin, high, compressed ridge, running a long distance forward. Hooks small, stout, strongly curved, pointed, often with secondary denticles near the base, a little divaricate, their bases widely distant and connected by a nearly straight edge, from the middle of which depends a small, smooth, transversely oval, appressed tooth, bending a little forward; at the extreme base of the hooks, on either side, is a recurrent, rather long and slender, blunt denticle, directed downward and a little outward and forward. Arms rather slender, tapering slightly, directed downward and a little forward, at bottom bent abruptly at less than a right angle, a little beyond which they expand and unite beneath, supporting the inferior armature, consisting of a broad, quadrate, gibbous patch of raised points.

Left clasp: Main body large, broad and long, increasing but little in width, quite gibbous, longitudinally nearly straight. Blade excessively long and slender, the outer portion so twisted as to be nearly horizontal and uppermost, and in this position is sinuous and directed

a little upward; it is also bent pretty strongly inward with a very slight curve; it is nearly uniform, tapering slightly on the outer half, the extremity curving downward and slightly rounded, the apex and apical portion of the inner edge armed with very minute denticulations, directed inward; basal process directed at first upward and backward, the posterior portion bent pretty strongly downward; but just beyond the base it turns abruptly at nearly right angles backward, and extends subparallel to the blade for some distance, developed as a subspatulate, slender plate; the whole rounded tip and the inner edge are armed, the former with minute, the latter with heavier serrations. Lobe developed as an extension of the upper posterior angle of the main body, directed backward and upward, and curved also inward, of nearly uniform breadth, twice as long as broad, the tip broadly rounded; the upper edge of the main body is strongly, broadly and roundly excised at the base of the lobe.

Right clasp : Main body similar to that of the opposite side but slenderer. Blade quite similar to that of the opposite clasp, very slightly broader, and beyond the middle expanding slightly instead of diminishing, the tip itself tapering, rounded, and with the outer half of the inner edge very delicately denticulate; basal process broad, triangular, bluntly pointed, directed backward, curving over inward, armed with very minute and very distant serrulations. Lobe developed as a somewhat similar, rather longer plate, more strongly curved inward, directed upward and unarmed, the main body deeply and roundly excised at its anterior base.

California, H. Edwards.

Nisoniades Tibullus nov. sp. Fig. 12.

Upper organ: Main body rather slender, short and high. The crest is composed of a pair of small, broadly rounded, prominently raised, united alations, inclined toward each other at more than a right angle, each facing backward, upward and a little inward, a little gibbous and supported by a sharp, elevated ridge running from either side of the anterior part of the main body; they are completely covered above with longer and shorter spinules, developing, on the upper edge, into quite long, curving, bristly hairs, arranged, when viewed from above, somewhat in the form of a horseshoe. Hooks short, very stout and broad, very widely separate at base, slightly divaricate, asymmetrical, with occasional, more or less developed, lateral denticles; dependent from the ridge uniting their bases is a very short and broad, appressed, fabiform tooth, its edges a little raised.

Arms directed downward and a little forward, of nearly equal size throughout, at bottom curved very abruptly backward and upward, but with the lower edge expanding to meet that of the opposite side, and bearing upon their united limbs the two rounded lobes, directed upward and united at their edge, which form at once the apices of the arms and the inferior armature of raised points.

Left clasp: Main body large, gibbous, the base docked diagonally, increasing a little in breadth outwardly, slightly curved longitudinally, the upper edge incurved and lobed beyond the middle, docked squarely at the apex; the outer half is deeply grooved above the base of the blade. Blade very long and slender, strongly depressed, nearly uniform in width, the apical third narrowing a little, the whole curving strongly inward, the basal half also directed backward in a straight course, the apical half curving a little upward, the extreme tip squarely appressed and bent inward, inner edge excised just before the apex, and beyond minutely denticulate; basal process broad at base, compressed, directed upward, its upper posterior angle produced backward as a somewhat elongate, rounded lobe, separated from the blade, to which it is nearly parallel, by a very deep hollowing; the basal portion of the upper edge curves slightly inward, the whole upper outer margin, together with the apical half of the hind prolongation armed with pretty strong but minute teeth. Lobe small, consisting of a subspatulate flap, projecting from the upper hind corner of the main body, bent strongly inward, but with an equally upward backward course, as long as the upper edge of the basal process of blade and half as broad as long, the tip broadly rounded and the apical half minutely pitted.

Right clasp: Main body much narrower than that of the opposite side, nearly equal, excepting at the base, the upper margin with an acute denticle in the middle, beyond which it is roundly and deeply excised. Blade long and rather slender, strongly compressed, twisted just beyond the base so that the outer becomes the upper surface, on a side view directed at first straight backward, then with a slight upward curve and again at the tip straight backward; viewed from above, curved a little and regularly inward, rounded and minutely denticulate along the inner angle of the apex; basal process wanting. Hind process of lobe consisting of a small, rounded, nearly semicircular, compressed pad, at the middle of the apex of the main body, directed backward, curved a little inward, the apical half minutely denticulate; upper process composed of a pretty large, sub-

triangular pad, directed upward, curving over inward and even a little downward, the apex rounded, thickened and gibbous.

California.

Nisoniades Horatius nov. sp. Fig. 13.

Upper organ: Main body rather long and slender, not high. Posterior extremity bearing a greatly elevated crest, similar to that of the following species, *N. Virgilius*, formed of a half funnel-shaped plate, slender at base, expanding greatly upward, facing backward but scarcely upward, its upper edge recurved and spiculiferous, its right extremity extraordinarily produced, extending as a sort of bristly finger backward and outward, not upward, and at tip curving downward; its lower edge also sometimes bears a slight bristly tubercle in the middle. Hooks much as in *N. Virgilius*, but the left one almost entirely obsolete; the dependent tooth broad, obpyriform, the edge forming a slightly projecting rim. Arms and inferior armature as in *N. Virgilius.*

It should be mentioned here that the drawing of the upper organ was taken from a larger specimen than that which furnished the illustration of the clasps; the former came from Texas; the latter from Massachusetts.

Left clasp: Main body broad and rather short, slightly gibbous, the upper edge full at base, the lower nearly straight. Blade moderately long, the upper three fourths bent over inward so as to be horizontal, or on the basal half slightly deflected, nearly equal in width, but a little constricted near the middle, the apical fourth tapering to a bluntly rounded apex, which is curved slightly downward; viewed laterally, the blade tapers regularly and slightly, is straight and horizontal; viewed from above it curves a very little inward; basal process developed as a slender, scarcely compressed dactyl, bent over backward from its origin, so as to be nearly horizontal on a lateral view, scarcely curving inward, near one third as long as the blade, a little enlarged at the tip, and armed with a few very minute spinules around the edge of the enlarged portion. The lobe consists of an upward prolongation of the upper hind angle of the main body into a bluntly pointed triangular expansion, curving inward, leaving the apical border of the main body straight, and at right angles with the lower margin.

Right clasp: Main body much as on the opposite side, but the upper portion of the base is not so full, and beyond the middle the upper border is slightly elevated. Blade broad, not very long, directed

slightly upward, especially at the tip, slightly excised along the middle, a very little larger at the apex than at the base, gibbous at the base, beyond flat, twisted so that the outer surface becomes nearly horizontal, curved slightly inward, the apex, especially the upper angle, still more so, the tip docked almost squarely and a little diagonally, so that the apical edge is directed almost straight backward, very broadly rounded, the edge slightly thickened, the angles not sharp; basal process consisting of a small, backward directed, triangular tooth, bluntly pointed and as long as the smallest breadth of the blade, and a little longer than the breadth of its own base. Lobe consisting of an upward, posterior projection of the upper hind angles of the main body, forming a subtriangular, broadly rounded, gibbous pad, curving inward and a little backward, separated from the basal process of the blade by a very broad, deep and regularly curved excision.

New England, Texas.

Nisoniades Virgilius nov. sp. Fig. 14.

Upper organ: Main body long and slender, not high. Posterior extremity bearing greatly elevated asymmetrical alations, united in a somewhat horseshoe-shaped, curving, hollowed plate or crest, excessively produced as a slightly upraised, pointed triangle on the right side, directed backward and upward; the whole crest faces upward and backward, its united upper edge fringed with minute spicules, and is supported on either side by a slender ridge running from near its middle a short distance forward to the side of the main body. Hooks very small, asymmetrical, the right being much the larger, pointed, scarcely curving downward at tip, approximate at base, divergent; tooth small, sessile, spatulate, appressed. Arms asymmetrical, very slender, nearly uniform, curving, having first a general direction downward and slightly forward, afterwards backward, upward and inward, the curve quite regular, expanding slightly at tip and bearing between the extremities the inferior armature—a rather small rounded field of minute raised points.

Left clasp: Main body almost identical in form with that of *N. Horatius*, excepting that the apical border lies at a little more than a right angle with the lower margin, on account of the greater projection of the lobe. Blade as in *N. Horatius*, excepting that the basal half of the upper two thirds is bent over horizontally, the part beyond not quite so much; it is also a little broader, directed slightly upward, the tip bent scarcely

downward; basal process not quite so long as in the *N. Horatius*, and the whole apical half enlarged. Lobe projected further backward than in *N. Horatius*, forming a longer and more slender triangle.

Right clasp: Main body quite as in *N. Horatius*, but a little broader. Blade also similar, but broader throughout and at the tip nearly one half as broad again as in the middle; basal process consisting of a small, elongate, subtriangular tooth, nearly uniform in width, bluntly pointed, fully twice as long as broad at the base and as long as the narrowest breadth of the blade, directed straight backward. Lobe as in *N. Horatius*, but a little larger and longer and scarcely so much incurved.

New England.

GROUP VII.

Upper organ: crest greatly elevated, expanded laterally into very large, curving, prickly, asymmetrical flaps; hooks and tooth as in group V. *Clasps:* much as in group VI.

Nisoniades tristis (Boisduval.) Fig. 15.

Upper organ: Main body long and rather slender, not high, somewhat arched; posterior extremity of the upper surface strongly elevated and then expanded laterally into very unequal, outward and downward curving alations, that of the left side forming an excessively enlarged, broad, rounded lobe, the lower anterior portion bent downward more than the other and produced anteriorly to a considerable extent; the whole upper surface and edges and a portion of the under surface are covered with minute raised points, which become developed on the anterior edge into distinct spinules; that of the left side form a very long and slender, slightly sinuate, unarmed plate, somewhat constricted toward the base, the tip well rounded, not quite as long as that of the opposite side. Hooks moderately stout, short, arching, pointed, scarcely divaricate, rather distant at base, the right nearly abortive; tooth appressed, subcordate, with compressed neck, projecting downward and very slightly backward, the edges unarmed, emarginate. Arms slender, tapering slightly, directed downward, with a slight anterior curve, bent backward abruptly at less than a right angle and then directed backward, upward and inward, bearing between their tips the inferior armature, a rather small, asymmetrical, reniform field of raised points.

Left clasp: Main body very broad, uppermost portion of the base quite full, lower edge very slightly curved; longitudinally nearly straight, laterally but slightly gibbous. Blade long, directed almost horizontally

backward, the distal portion tapering very slightly; viewed from above, it appears to curve slightly inward, to be strongly depressed, the inner margin curved slightly downward in the middle, pretty slender, the basal half of nearly uniform width, just beyond the middle furnished with a slight tooth on the inner edge, beyond which the blade is strongly excised and continues again of nearly equal width, but tapering slightly to the well rounded tip, which is serrulate with incurving hooks; basal process shaped somewhat as in *N. Virgilius*, but smaller and more spatulate, almost the whole margin serrulate with blunt spines. Lobe consisting of a very broad and short, broadly rounded extension of the upper hind angle of the main body, directed backward and upward, its lower corner angular and incurved.

Right clasp: Main body broad, not so full at the base above as on the opposite side but distinctly angulated and even slightly produced in the middle of the upper half. Blade not very long but broad, directed slightly upward, the outer surface twisted over so as to be almost horizontal, the middle of the inner edge depressed still more, the inner edge a little swollen in the middle of the basal half, beyond excised, broadest at the tip, which is obliquely and squarely docked, most minutely serrulate and slightly curved; basal process wanting. Lobe exceedingly broad and very short, directed backward and upward, very gibbous, the upper angle produced roundly and considerably, the lower forming the hind process—a rather small, triangular, bluntly pointed denticle, serrulate on the edge.

California, H. Edwards.

GROUP VIII.

Upper organ: unknown. *Clasps:* left blade exceedingly broad and rapidly tapering; its basal process nearly sessile; upper process of left lobe greatly developed; right lobe developed similarly and parallel to the right blade, but smaller.

Nisoniades Plautus nov. sp. Fig. 16.

Upper organ: This portion of the only specimen we have seen proves to be damaged to such a degree that neither drawing nor description could be made; we can only say that it seems to differ from all the usual types of this extraordinary genus as greatly as the clasps do.

Left clasp: Main body large, broad, widening, quite gibbous, roundly curved longitudinally. Blade excessively broad, more than

half as broad as the main body, directed upward and curved somewhat inward, particularly at the tip; the basal half tapers but slightly; the apical half tapers strongly to a fine point, is bent slightly downward, twisted so as to bring the outer surface uppermost, leaving the posterior inner termination of the basal half protruding inward as a blunt, rounded, gibbous denticle; the apex is hooked slightly inward and armed with very minute denticulations; basal process sessile, consisting anteriorly of a triangular, pointed, spinous, depressed piece, directed inward and forward, and curving slightly upward; and posteriorly of a basal, unarmed, long and slender, compressed but very gibbous, dactyloid plate, directed backward, and curving strongly upward, terminating in a rounded apex. Lobe arising from the upper, hind angle of the main body, directed backward and upward and curved quite strongly and regularly inward, consisting of a compressed, pretty long and broad plate of uniform width, more than twice as long as broad, with a rounded apex, and having its lower margin broadly and slightly excised.

Right clasp: Main body differing extraordinarily from that of the opposite side, being very slender, the base of the blade marked on the lower edge by a greatly produced, pointed, triangular denticle, more prominent than in any species examined by us, and directed downward. Blade long, broad, compressed, directed a little upward, curving a little inward; the basal three fourths of nearly equal width, tapering slightly; gibbous and twisted so as to bring the greater portion of the outer surface uppermost; the apical fourth is quite different, being only half as broad as the basal three fourths, on account of the abrupt excision of the lower half, causing the basal portion to terminate with a sharp lower angle, which, with the apical half of this portion of the lower edge, is bent inwards; the terminal fourth is scarcely half as broad as the basal portion, broadens slightly toward the apex, and is squarely docked at tip, the inner angle produced slightly as a minute, pointed denticle; basal process wanting. Lobe unusually developed, forming a long, compressed dactyl, subparallel to the blade, its outer surface a little twisted so as to face somewhat downward and curved strongly inward, especially near the tip; it is of nearly uniform width, its upper edge slightly swollen opposite the outer half of the larger portion of the blade, and has its tip produced along its lower edge only, tapering rapidly as if by an oblique excision, and ending in a roundly pointed tip, the whole of

the narrowed portion being bent slightly downward, curving strongly inward and armed with minute denticles.

Florida.

We close with the following statements concerning the synonymy of the species: *N. Ennius* nob. is the northern representative of *N. Juvenalis* Westw., and has generally been taken for that species. *N. Lucilius* Lintn. and *N. Icelus* Lintn. have hitherto been confounded with *N. Persius* Scudd. and *N. Brizo* Westw., but separated from the same by Mr. J. A. Lintner in a paper shortly to be published. *N. costalis* Westw. is probably *N. Juvenalis* Westw., though possibly *N. Ennius* nob., or even *N. Virgilius* nob.; it can hardly be satisfactorily determined without an examination of the type. Either *N. Propertius* nob. or *N. Tibullus* nob. may be the Californian species which Boisduval, in his Lépidoptères de la Californie, has considered to be *N. Juvenalis* Westw. *N. Tages* var. *Cervantes* of Boisduval, in the same paper, is an undescribed species which we did not obtain in season to include in this essay. We have seen no Californian species which could possibly be referred to *N. Brizo* of Boisduval, Lépidoptères de la Californie. We doubt whether *N. Lherminieri* Westw. can be included in this group; and *N. Catullus* Westw. is certainly the representative of a distinct genus.

Explanation of the Plate illustrating Asymmetry in the genital armor of Insects. The lettering on all the figures is the same.

U. Side view of the upper organ from the right side.
U_1. Ditto, from the left side.
Ua. Upper organ from above.
Ub. Upper organ from behind.
R. Right clasp.
Rb. Right clasp from above.
L. Left clasp.
Lb. Left clasp from above.
Figs. 1–16 are magnified 20 diameters.
Fig. 17 is magnified 35 diameters.

Annual Meeting, May 4, 1870.

Dr. C. T. Jackson in the chair. Seventy three members present.

Mr. S. H. Scudder presented the following Report of the Custodian for the past year: —

In presenting, to-night, my final report of the annual operations of the Society, I trust the members will pardon an occasional review of the experience of past years; such remarks will be brief and simply offered to show what progress has been already made and what lessons can be drawn for future guidance. As it is evident that in many minds our present system is an experimental one, any considerations which may help to solve the problems of the Society's daily life will be worthy of attention.

During the year that has just closed there have been eighteen general meetings of the Society, eight of the section of entomology, and seven of that of microscopy. At the general assemblies, the average attendance has been thirty two, at those of the entomological section eleven, and at the microscopical meetings nine. Forty seven scientific communications, made at these meetings by twenty five persons, have been printed in full or by title in our Proceedings, viz., thirty one papers by fifteen persons at the general meetings; twelve papers by nine persons at the meetings of the entomological section, and four papers by as many persons at those of the section of microscopy. The following are their titles: —

Agassiz, A. Notes on Beaver Dams. *June* 16, 1869.
On the habits of a few Echinoderms. *June* 16, 1869.

Allen, J. A. Notes on the Mammals of Iowa. *December* 17, 1869.
Notes on Massachusetts Reptiles and Batrachians. *March* 16, 1870.

Brewer, Dr. T. M. On unspotted crow's eggs. *October* 20, 1869.

Coues, Dr. E. On a chick with supernumerary legs. *May* 19, 1869.

Observations on the Marsh Hare. *June* 2, 1869.

Notice of a cyclopean pig. *June* 16, 1869.

On the Osteology and Myology of Didelphys virginiana. *October* 6, 1869.

Dall, W. H. Description of the alluvial deposits of the Yukon River, Alaska. *October* 20, 1869.

On the distribution of marine animals. *November* 3, 1869.

On winter insects in Alaska. *November* 24, 1869.

Revision of the Classification of the Mollusca of Massachusetts. *March* 16, 1870.

Edwards, A. M. Notes on Diatomaceæ. *February* 9, 1870.

Hagen, Dr. H. On Listing's improvements of the microscope. *November* 10, 1869.

Synopsis Pseudoscorpionidum Synonymica. *March* 23, 1870.

Jackson, Dr. C. T. On native carbonate of magnesia and on the method of making artificial stone. *December* 3, 1869.

On the origin of syenite and granite. *December* 3, 1869.

Jeffries, Dr. B. J. On the canal of Fontana. *February* 2, 1870.

Minot, C. S. American Lepidoptera. I. Geometridæ. *May* 26, 1869.

American Lepidoptera. II. Phalænidæ. *November* 24, 1869.

Muller, F. Account of the nests of a species of Termes in Brazil. *January* 26, 1870.

Niles, W. H. Objections to the alleged morainal character of the drift near Watertown. *April* 20, 1870.

Perkins, Dr. G. H. The Molluscan Fauna of New Haven. Part I. Cephalopoda and Gasteropoda. *October* 6, 1869.

The Molluscan Fauna of New Haven. Part II. Acephala and Bryozoa. *November* 3, 1869.

Putnam, F. W. Notes on the occurrence of Euleptorhamphus longirostris on the coast of Massachusetts. *March* 16, 1870.

Sanborn, F. G. Insect captures in Andover. *January* 26, 1870.

Scudder, S. H. Remarks on the manuscripts of Dr. T. W. Harris. *November* 17, 1869.

On the asymmetry of the external genital armature of the males of Nisoniades. *January* 26, 1870.

Description of the larva and chrysalis of Papilio Eurymedon of California. *March* 2, 1870.

On the synonymy of Thecla calanus. *March* 23, 1870.

Remarks on Grapta interrogationis. *March* 23, 1870.

Scudder, S. H. and Burgess, E. On asymmetry in the appendages of Hexapod Insects, especially as illustrated in the lepidopterous genus Nisoniades. *April* 27, 1870.

Shaler, N. S. On the changes in the geographical distribution of the American buffalo. *October* 6, 1869.

Note on the occurrence of the remains of Tarandus rangifera Gray at Big Bone Lick, in Kentucky. *November* 17, 1869.

On the relations of the rocks in the vicinity of Boston. *December* 3, 1869.

On the parallel ridges of glacial drift in Eastern Massachusetts, with some remarks on the glacial period. *January* 19, 1870.

On the Phosphate Beds of South Carolina. *March* 2, 1870.

Note on the glacial moraines of the Charles River Valley, near Watertown. *April* 20, 1870.

Shurtleff, C. A. On an abnormal caterpillar of Callosamia Promethea. *January* 20, 1870.

Stearns, R. E. C. On a new species of Pedipes from Tampa Bay, Florida. *October* 6, 1869.

Stodder, C. On the two valves of Aulacodiscus oreganus. *January* 12, 1870.

Trouvelot, L. Upon the tendency of tree boughs to bend in an easterly direction. *March* 16, 1870.

Whitney, C. P. Description of the female of Limenitis Proserpina. *May* 26, 1869.

WHITNEY, W. F. The structure of the hairs of Tillandsia usneoides. *April* 13, 1870.

WYMAN, DR. J. Discovery of a true crocodile in Florida. *May* 19, 1869.

On the brain of Didelphys virginiana. *October* 6, 1869.

This number is much smaller than that of the two previous years, and indicates, to a certain extent, what all have noticed, a lamentable decline in the interest of our meetings. We lack, just here, organized effort; let the evening sessions be placed in the charge of one or more persons who shall see that each meeting is ably sustained, throw open our doors to all who wish to come, announce, if you will, the subjects to be treated (as is always done in England), and the increase of attendance and of varied discussion will act with such mutual force that no more complaint will be possible.

Some have thought that the want of interest in our meetings was chargeable to those who have devoted themselves to pure science; that since their number has increased a feeling has arisen that only that which is new should be brought to the attention of the meetings. Yet I think two things will be found to be true: that our scientific quite as frequently as our non-scientific men speak of subjects which are not novel; and that were the interest of novelty taken from the record of those earlier days which we are told to look back upon with regret, we should find comparatively little left.

One Honorary, three Corresponding and thirty nine Resident Members have been elected. Of the resident members fourteen have not complied with all the requirements of the Constitution, and their names are not yet placed on our rolls.

Two courses of evening lectures, each twelve in number, have been given during the winter. The first — Sketches of Animal Life, by Mr. Edward S. Morse — was attended by an average audience of seventy six persons. The second —

The Earth We Live On, by Mr. William T. Brigham — had an average attendance of one hundred and ninety eight persons. A third course, consisting of four lectures by Mr. Francis G. Sanborn, is still in progress, and is entitled Familiar Talks upon Insects; the attendance thus far has averaged sixty two. On the second evening of Mr. Brigham's course there was an attendance of two hundred and sixty five persons, the largest number present at any one lecture.

A few figures will show the constantly increasing success of our experiment in introducing lectures as a part of our system of popular instruction. During the first year, the audiences averaged 56; during the second, 73; and during the third, or past year, 127. Lectures given by the same person, on different topics, have had, in one case, an increasing average audience of from about 40 to 75; and in another from 100 to 198 — or, if we look at the subjects alone, the attendance on our zoölogical lectures has nearly doubled, on our botanical courses has risen from 68 to 100, on our geological from 66 to 198, and on our short courses devoted to special subjects from 12 to 62. Yet no systematic plan has been adopted by the Council to further this mode of imparting information. The lecturers have ordinarily been selected shortly before the delivery of their courses, and but brief announcement given to the public of the Society's intentions. Surely, with a definite system, with lecturers chosen deliberately and seasonably and with the programme of the courses announced early in the autumn, we could not fail to interest and instruct a much larger class than any to which we now have access.

Of our publications there is little to be said. The present number of subscribers to our Memoirs is 130, to our Proceedings, 183. A large number of Memoirs await the resumption of our quarto publications, which, for economy's sake, have been temporarily suspended; a further postponement of activity in this department cannot fail to be disas-

trous. In our Proceedings we have finished the twelfth, and extended far into the succeeding volume, printing in all 291 pages. A small edition of the last annual report of seventy six pages was printed separately for special distribution, and the address of Professor Agassiz at our recent celebration of the Humboldt centennary, together with an account of the evening's festivities, an octavo pamphlet of one hundred and seven pages, has been largely distributed.

And here we may refer to the part which the Society took in celebrating the centennial recurrence of the birth day of Humboldt; conceived and carried to a successful issue mainly through the energy and perseverance of the Rev. R. C. Waterston, the Society is deeply indebted to Professor Agassiz both for the heartiness with which, though suffering in health, he undertook an unaccustomed task, and for the characteristic simplicity and able manner in which he carried it out. As the financial results of the day $7,040.66, mainly the result of special subscriptions, have been placed in the hands of the Trustees of the Museum of Comparative Zoölogy as a Humboldt Scholarship, for the benefit of young and needy persons engaged in study at that Museum; the officers of the Museum have formally accepted the trust.

The transmission of our publications to home and foreign Societies has, of course, been small, yet we must not omit to thank the Smithsonian Institution for continued liberality in their free delivery abroad. We have sent away 30 parts of the Memoirs, 18 volumes and 8 parts of the Journal, 15 copies of the Harris Correspondence, 2 copies of the Annual, 5 of the yearly Reports, 86 complete volumes and loose sheets equivalent to about 265 volumes of the Proceedings—amounting in all to over 200,000 octavo pages.

Besides these publications, we have distributed on behalf of the Commonwealth, three hundred copies of the Report on the Invertebrates of Massachusetts, recently published by the State. The Council petitioned for five hundred copies;

the original resolve recommended a grant of four hundred copies, but it was reduced previous to its passage to the number above mentioned; by the terms of the resolve, the Society was compelled to limit its distribution to foreign academies and libraries and most of the principal ones were thus supplied. The judicious action of the Legislature, in placing its scientific publications where they will be of the greatest permanent benefit, merits the commendation of all who, like ourselves, are aiming at the widest diffusion of knowledge.

The following Societies, in response to our particular solicitation, have favored us with many early volumes of their publications.

* Académie des Sciences, Agriculture, Arts et Belles-Lettres	Aix.
New York State Agricultural Society	Albany.
* Naturforschende Gesellschaft	Bamberg.
* Bombay Geographical Society	Bombay.
* Journal of Anatomy and Physiology.	Cambridge, Eng.
Naturforschende Gesellschaft Graubündens	Chur.
Oberlausitzische Gesellschaft der Wissenschaften	Görlitz.
Nederlandsche Entomologische Vereeniging	'sGravenhage.
Medicinisch-naturwissenschaftliche Gesellschaft	Jena.
* Verein zur Verbreitung naturwissenschaftliche Kenntnisse	Kiel.
Kongelige Nordiske Oldsskrift Selskab	Kjöbenhavn.
* British Museum	London.
Zoölogical Society	"
Société Linnéenne	Lyon.
Reale Istituto Lombardo di Scienze, Lettere ed Arti	Milano.
Società Italiana di Scienze Naturali	"
* Tyneside Naturalists' Field Club	Newcastle-upon-Tyne.
* Société Botanique de France	Paris.
K. Böhmische Gesellschaft der Wissenschaften	Prag.
* Société des Sciences Naturelles	Strasbourg.
Provinciaal Utrechtsch Genootschap van Kunsten en Wetenschappen	Utrecht.

Of these we must particularly mention the Bombay Geographical Society, the Görlitz Scientific Association, the Royal Institute of Science at Milan, the British Museum at

London and the Utrecht Society of Arts and Sciences, which have given us almost or quite complete sets of their Transactions, often dating back many decades.

We have also entered into exchange, for the first time, with the following Academies and Journals additional to those marked with an asterisk in the preceding list.

Maryland Academy of Sciences	Baltimore.
Zeitschrift für Ethnologie	Berlin.
Bowdoin Scientific Review	Brunswick, Me.
Agricultural and Horticultural Society of India .	Calcutta.
Dudley and Midland Geological and Scientific Society	Dudley.
Edinburgh Geological Society	Edinburgh.
R. Comitato Geologico d'Italia	Firenze.
Teyler's Godgeleerd Genootschap	Haarlem.
Nature	London.
The Journal of Applied Science	"
Académie du Gard	Nîmes.
Petites Nouvelles Entomologiques	Paris.
Revue des Cours Scientifiques	"
North China Branch of the Royal Asiatic Society .	Shanghai.
Académie des Sciences, Inscriptions et Belles-Lettres	Toulouse.
Kongelige Norske Videnskaber-Selskab . . .	Throndhjem.
Istituto Veneto	Venezia.

The accompanying table gives a summary of the additions to the library by volumes, parts of volumes, pamphlets and maps or charts; they are more numerous than during any previous year of the Society's history.

	Octavo.			Quarto.			Folio.			Maps and Ch'ts	To'l
	vls	pts	ph	vls	pts	ph	vls	pts	ph		
Books presented by individuals . .	71	37	149	37	24	19	13	3		13	366
" " " Publishing Com.	1	22	12			1					36
" purchased (Wolcott Fund) .	81	41	13	40	8	2	5		1		191
" deposited in Binney library .				2							2
" " by the Republican Institution	22										22
" received in exchange . . .	596	559	111	45	277	69	2	33		17	1709
Total .	771	659	285	124	309	91	20	36	1	30	2326

The binder, having attended to the most important series in the library, has recently been dismissed. During the past year one thousand and ninety eight newly bound volumes have been placed on the shelves, a number of repairs made and one hundred and twenty copies of the Proceedings covered. Work has also been done for outside parties, and the signatures of the Proceedings and extras issued to authors, folded. Special reference should here be made to the Harris manuscripts; the binder has secured the most delicate fragments with such ingenuity and skill that both sides of the manuscripts can be seen when necessary, without danger; thus all may inspect these valuable memoranda and mementoes.

The assistants in the library have continued the revision of the Card Catalogue and completed about one third. The remarkable growth of the library has delayed the progress of the work, not only from the time required to attend to the new accessions and the preparation of unbound series for the binder, but also from the changes necessitated in the arrangement of the cases. We shall soon be obliged to build the gallery in the back library. The pamphlets have continued to receive constant attention whenever time permitted, and from one fourth to one third of the older pamphlets, as well as all the new donations, are now accessible.

The Librarian has recently made an enumeration of the books; they have been counted as bound, whether containing more than one volume, as is frequently the case, or not; the parts have been estimated at their proper proportion of the volumes to which they belong and the pamphlets counted separately; this enumeration therefore gives the number at its least valuation, and is proportionally a much smaller estimate than those previously made. There are 9,396 volumes and 2,677 pamphlets. Of these volumes 1,010 belong to general literature, mainly deposited by A Republican Institution; 806 are botanical, 453 entomological, 402 geological and mineralogical, 510 encyclopædic; 613 treat of verte-

brates, 536 of travels and local faunæ, and Journals and publications of Societies number 4,173. No classification of the pamphlets can be given until they are in a more orderly condition.

707 books have been borrowed from the library by 85 persons; none are supposed to have been lost.

The exploration on the Isthmus of Tehuantepec, on the part of Prof. F. Sumichrast, referred to in the preceding Report, has been continued during the past year, and several boxes of specimens have been forwarded to Washington.

In accordance with the arrangement made with the Smithsonian Institution, all the insects have been sent to us for arrangement and identification, the other collections being distributed to specialists, for a like purpose. The birds are in the hands of Mr. George N. Lawrence of New York, by whom a list will be prepared on the completion of the entire labor, and presented to the Society for publication. The reptiles, in a similar manner, have been placed in the hands of Prof. E. D. Cope, and the land shells in the care of Mr. Thomas Bland of New York. It is believed, in view of the eminence of Prof. Sumichrast as a naturalist, and his well-known ability as a collector, that important results to science will be developed by a careful examination of his collection. The expenses of this exploration, in addition to the contribution on the part of the Society, have been borne mainly by the Smithsonian Institution and the Kentucky University at Lexington, aided by a moderate contribution from the Academy of Natural Sciences at Philadelphia. Such portion of the expense as has not been met by subscriptions already named, will, it is hoped, be defrayed by the sale of duplicate specimens.

It is with great regret that we announce the death of our esteemed coadjutor, Col. A. J. Grayson, to whose labors, in the exploration of north-western Mexico, the Society has contributed in connection with the Smithsonian Institution.

It has been the desire of the two institutions to secure, through his means, a careful investigation of the fauna of the Sierra Madre of north-western Mexico; and as June was considered the most eligible time for this labor, Col. Grayson made a short visit, prior to that period, to the Island of Isabella, off the coast, for the purpose of studying the habits of the sea-fowl during their breeding season. On this island he laid the foundation of a malarious disease that impaired his constitution, and after an illness at his home, in Mazatlan, he died on the 17th of August last.

The fund contributed by the Society for the exploration already referred to, was unexpended at the time of his death, and was returned to the Institution by his widow, and the amount was transferred, in accordance with a vote of the Council, to the expedition of Prof. Sumichrast. Prof. Baird has in preparation a list of the birds collected by Col. Grayson during his explorations in north-western Mexico, which he expects to complete and present to the Society for publication, as soon as his other duties will permit. The specimens obtained embrace quite a number of new species, which will be described in the work mentioned.

In accordance with an arrangement made by the Custodian with the Secretary of the Smithsonian Institution, a considerable quantity of miscellaneous unassorted material has been received from the Institution and returned in an orderly condition, the Society being repaid for the labor expended by the first choice of the duplicates.

Having concluded to give up the Ethnological department, the Boston Marine Society have allowed us to transfer the collections long ago presented by them, and consisting mainly of Polynesian implements, to the Peabody Museum of Archæology; the space thus vacated will be given to mounted specimens of mammals.

The Council have lent a number of typical birds to the Institute of Technology to be used in their regular courses of instruction; temporary loans from other departments

have also been made, and our collections frequently visited by classes from the same establishment; it is greatly to be desired that still closer bonds may unite us to this sister institution, having, in part, at least, a common end — the promotion of popular scientific knowledge. Our doors have been opened at different times to a number of classes from other establishments, public and private, and we hope that many more may avail themselves of the cordial invitation which we would extend to all.

There have been about 40,000 visitors to the Museum during the year. The building has been open to the public 103 days, and the number of visitors has averaged 391. The greatest number present on any one day was 781, October 23d. These figures are doubtless lower than they should be.

The department of Mammals and Comparative Anatomy has received from the Smithsonian Institution a stuffed specimen of the great antarctic seal collected on the exploring expedition of Commodore Wilkes. A living opossum and a number of its young, sent in the summer by Dr. C. Kollock, of South Carolina, have been mounted in characteristic attitudes, and interesting specimens have been received from the Union Street Menagerie, Capt. Bowley and others. The long neglected catalogue has been brought up to the present time, and the new style of label attached to about one hundred specimens.

The mounted Birds have received the most careful attention during the year. Every specimen has been taken down, thoroughly examined, cleansed, and where necessary, treated with benzine and other materials; secure and simple appliances have rendered the doors of the cabinets as nearly air tight as possible; the bolts have been repaired; every crack has been carefully closed, the whole interior repainted, and the ravages of insects so checked that with comparatively little patience and care these pests can be

entirely eradicated; to accomplish this, four or five persons have worked for two months continuously from eight to ten hours per day, extending their labors far into warm weather. Since that time the collection has been repeatedly examined, and very many specimens repoisoned and carefully watched. The Curator now reports them to be in good order. The case for skins has been completely filled, and many unmounted specimens have been stored in some of the transportation trunks for want of a more suitable place. Mr. F. E. Everett has contributed twenty seven interesting skins collected by himself in Colorado, the Smithsonian Institution have added about fifty specimens from various American localities, including some of the rarest birds of Alaska; and Messrs. S. Mixter, H. A. Purdie and others, have presented a number of specimens from this vicinity.

Extensive additions have been made to our collections of Bird's Eggs and Nests, mostly by exchange. From Mr. G. L. Layard of the South African Museum at Cape Town, we have received a choice consignment of more than three hundred eggs of one hundred species of birds, several of which are quite rare; the Smithsonian Institution has sent us a good many European nests and eggs, and very large series of valuable nests and eggs of American birds; a still larger collection, selected by the Curator on a recent visit to Washington is daily expected. Two invoices of eggs have been received from the Rev. Mr. Jones, of Madison, Conn., containing about twenty species useful for exchange, and Dr. Baldamus, of Halle, has sent eggs of twenty four species of very rare and valuable birds, mostly from Africa, Eastern Europe and Western Asia. The Curator has also added nearly forty species of European eggs from his own collection, Mr. S. Mixter has presented some of the bulkier nests of New England birds, and Mr. B. P. Mann about fifty eggs and nests collected by him in North Carolina.

In exchange for many of these the Curator has made good

use of the valuable duplicates presented last year by Mrs. Bryant. Over three hundred nests, about one half with the proper complement of eggs, have been assorted, labelled and placed on exhibition, and the collection is in admirable order; the new accessions have all been catalogued, the broken or fractured specimens repaired, and the duplicates placed singly in numbered wrappers, available at any moment for exchange. The Curator has commenced the arrangement of a special New England collection and requests, from all who are interested in its formation, the gift of authentic specimens.

One hundred and fifteen specimens, received from fifteen contributors, have been added to the collection of Reptiles. The greater part of them are from different localities in the United States; one tenth only are batrachians, the remainder true reptiles. One of the most valuable additions is a fresh specimen of the *Boa constrictor*, which has been finely mounted by Mr. Jillson. The two largest invoices were from the Southern States, one being the collection made by Dr. E. Coues, in North Carolina, and the other by Mr. B. P. Mann, in South Carolina. Two rare Massachusetts species have been received, the *Plestiodon fasciatus* and the *Malacoclemmys palustris*, both collected at New Bedford by Mr. R. C. Ingraham.

About two hundred specimens have been taken from the storage jars and placed on exhibition, and two thirds of the North American specimens in cases supplied with labels. The cataloguing of the collection has also been commenced, parchment numbers having been attached to nearly six hundred specimens. Unfortunately, in many instances, the records of localities and of the donor's names have either been lost, or were never properly made, so that the collection is less valuable than it would otherwise be.

In respect to our native species the most marked deficiency is in the turtles, many of our common species, when pres-

ent at all, being represented by very imperfect specimens. Neatly mounted or fresh specimens of even the New England species would be thankfully received. It is also desirable to make a complete collection of eggs of serpents and turtles, and specimens, either fresh or neatly prepared, are solicited by the Curator.

The Fishes, with but few exceptions, which would require an expenditure of about two hundred dollars, have been transferred to separate jars and placed upon the shelves, arranged according to faunæ; the specimens, 3896 in number, embraced in 1082 lots, have all been catalogued, and to a considerable extent identified, but not yet labelled; the collection is in good order; no important donations have been received.

The Entomological collections are in better condition and order than at any time during the past ten years; more than fifty trays of mounted and, to a very great extent, labelled specimens have been placed on exhibition, and we have no more available room in which to expand the collection; the erection of railing cases for the two bird rooms, would effect what is necessary for this purpose, and at the same time remove the danger of accident from the present lowness of the railing. The *Sphingidæ* and *Buprestidæ* have been carefully revised and relabelled by the assistant, and large additions made both by himself and the Curator; with Mr. P. S. Sprague's continued assistance, the revision of the *Carabidæ* of the general and of the Harris collection has been completed; attention has also been paid to the gigantic grasshoppers of tropical America, extensive series of butterflies have been spread and exhibited, and those of the Harris collection finally revised and arranged by the Curator; nearly two hundred jars of alcoholic specimens have been put in order, catalogued and labelled, and for the first time in this building placed on exhibition; the identification and prepara-

tion of the spiders and myriapods is also progressing favorably. Assistance has been rendered in various ways by Messrs. Burgess and Minot. Nearly five thousand specimens of insects have been sent away in exchange to Mr. E. L. Layard, of Cape Town, Africa, Mr. H. Edwards, of San Francisco, Messrs. W. Gulick, C. T. Robinson and G. L. Graef of New York, to the Rev. Mr. Bethune, of Canada, and to a number of persons in this vicinity. Mrs. Stratton has presented about twenty five hundred insects of all orders, collected near Boston by her son, the late Mr. Frank Stratton. Mr. H. Edwards has sent collections, principally of beetles, from Nevada, Oregon and New Zealand, and Dr. E. Coues a large collection of Orthoptera from North Carolina. The insects from Tehuantepec, taken on Professor Sumichrast's Expedition, are worthy of special mention; considerable additions have also been made by Messrs. Clapp, Dall, Waters and others.

Mr. S. I. Smith, of New Haven, has labelled a portion of our crabs, and described some that are new to science; the worms have been rearranged and relabelled, and almost the whole collection of Lower Articulates placed in the most satisfactory condition. The Curator has made a large collection of specimens in this department, and promises, when they have been carefully studied, to deposit a series in the Museum. Donations of New Zealand specimens have been received from Messrs. H. Edwards and P. S. Sprague.

The Curator of Mollusks reports that nearly all the larger genera of siphon-bearing gasteropods, belonging to the Pratt collection, are now permanently mounted on black tablets and placed on exhibition; a part of his time has been spent in making a preliminary arrangement of the bivalves belonging to the same collection, and these are also placed in our show cases. Valuable series of British shells have been received from the Smithsonian Institution and smaller dona-

tions from other parties, including in particular some Floridan mollusks presented by Mr. R. E. C. Stearns, Unionidæ from Cedar River, Iowa, by Mr. John King, and some three hundred mollusks from California, Peru and New Zealand, by Mr. H. Edwards.

The collection of Radiates has been greatly improved and little remains to be done; the alcohol has been replenished, new labels have been attached, and a large portion of the corals and sponges mounted in an erect position upon black tablets; interesting specimens from New Zealand and California have been sent by Mr. H. Edwards, and a series of sixty one specimens from various localities, with a select collection of named species from the Gulf of California, received in exchange from the Museum of Yale College; the latter are mostly types of new species described by the Curator.

The Microscopical collections continue in good order.

The Botanical department still remains without a Curator. It has, however, received an important addition in the herbarium of the Hon. J. A. Lowell, containing many thousand specimens carefully labelled, mounted and catalogued. Mr. Lowell has also given specimens of wood and a mass of unarranged duplicates and special collections, among the latter many of Oakes, Fendler, Wright and others. No collection of plants, says Mr. Brigham, the acting Curator, has ever been given to the Society, at once so large, so valuable and immediately accessible for reference. The cases in which these plants were contained have been placed in a new gallery, constructed for the purpose in the botanical laboratory; every sheet has been carefully inspected and put in order. By the generous subscription of a few gentlemen of this city, we have been enabled to purchase and mount a specimen of the Californian Redwood tree, consisting of a ring of bark,

forty feet in circumference. Professor Paul Reinsch has sent quite a series of European plants, principally mosses, lichens and algae; and a complete set of the mosses of North America, comprising over five hundred specimens, has been purchased from Professor Leo Lesquereux. The whole herbarium should be carefully examined and many specimens poisoned. The acting Curator recommends the erection of new cases in a gallery, in which dried mounted specimens, illustrative of the larger divisions of plants or possessing an economic value, could be exposed to view. The principal donors to the collection, in addition to those already mentioned, have been Messrs. G. B. Emerson, R. C. Greenleaf, J. M. Barnard, C. J. Sprague, J. F. Hunnewell, G. W. Armstrong and W. T. Brigham.

No further progress has been made in labelling the Palæontological collection; before this is done, the collection needs a thorough revision, requiring an amount of consecutive time which the Curator has not been able to devote to it; indeed he has only retained the office because no one of requisite knowledge could be found to replace him. The only important addition consists of a few specimens of Devonian Insects from New Brunswick — the oldest known remains of this group in the world, — presented by the Natural History Society of St. John.

The Department of Geology has been partially rearranged and labelled; no additions of any consequence have been made.

The Curator of Mineralogy has completed the entire rearrangement and relabelling of the mineralogical cabinet; this has been an arduous task, much time having been required to verify the correctness of the labels supplanted. The collection is now in perfect order, and the specimens number about twenty eight hundred. There is a great deficiency in

the number of species, and orders have been sent abroad to supply a portion of our wants from an appropriation for the purpose, made some time since by the Council. The Curator hopes that when the financial condition of the Society will permit, an annual appropriation for additions to his collections will be allowed. The department is indebted to Dr. C. T. Jackson, Messrs. W. S. Coffin, T. Gaffield, J. E. Cover, J. Parkman, Capt. G. H. Preble and others, for interesting specimens presented during the year.

From these accounts it appears that while some collections need a good deal of revision, and many are not yet entirely supplied with the uniform system of labelling lately adopted, the museum is in much better order and in a far safer condition than it has been at any time since our removal to this building. The library also has increased and the lectures have proved a success; but in our publications and in the interest of our meetings, we have sadly fallen off; last year, with an income of more than twelve thousand dollars, the Society published no more than it averaged for the first twelve years of its existence; then its members were but a handful, and the total annual receipts scarcely one thousand dollars; a yearly subsidy of three hundred dollars from the State was considered a bounty, but could not prevent the constant indebtedness of the Society,—so important did the publications seem to the founders of our institution; they were men who associated, not principally for the purpose of building up a great Museum, not even to create a popular interest in a knowledge of natural history, but—I use the language of a former President of the Society, frequently quoted before—"drawn together by a similarity of tastes and pursuits, for the purpose of increasing their knowledge by frequent intercourse."

Without being too tightly bound by the intentions of the founders of the Society, we must not altogether lose sight of the principles which they avowed. Should any urge that we interpret those principles wrongly, let them examine the

record. But it should also be taken into account that times have changed since then; public opinion which formerly sneered now applauds; therefore we should seize the work of the day and foster the sentiment already in our favor; we should "popularize Science,"—not by degrading it, but by divesting it of its mysteries, by elevating the popular knowledge to our own standard; yet that is not all; we must ourselves go forward, leading the way to higher fields of science; otherwise we forget the spirit of science itself, which is progress, and ask of others what we do not ourselves perform. Our Society has thus a double office to fulfil, and neither part can be neglected without detriment to both. Let it open to the public a museum fitted for study and showing, by the nicest devices, the meanings of Nature; let it set forth these truths in lectures, from which practically none shall be debarred; but at the same time give the more thorough students an opportunity to meet for mutual discussion, a library in which to consult the investigations of their fellow students in all parts of the world, and as prompt and satisfactory a channel for the publication of their own researches as any kindred institution affords. Debar our scientific men these privileges and you take from yourselves the good fame which the Society has fairly earned at home and abroad, and defeat the very object for which it was founded; you cast away the means of properly displaying the treasures the museum affords; and spurn the good will of many officers of the Society—those upon whom the chief burden of the meetings has always fallen; and it is a fact of no little significance that more than one half of the office bearers to whom, during the past ten years, the care of the Museum has been entrusted, have been drawn from the ranks of those who have been under the instruction of Professor Agassiz.

Concerning the Museum in particular, I will only add a few words. The Society is in possession of very large collections; with but few exceptions, sufficient, in my judgment, for all its purposes. Our aim should not be to sus-

tain a great museum; one such exists in our immediate vicinity, and it is squandering our resources to attempt to duplicate it; neither, and for the same reason, should we aim at making an industrial one; but rather seek to maintain, first, a popular educational museum, in which all and none but the characteristic forms of life and inorganic nature shall be displayed, and in such various ways as Nature herself employs; and second, a complete local collection, restricted at widest to our New England flora and fauna. The first is rightly expected of us by our Patrons; the second both by them and by visitors from without our limits; yet to carry out such a plan it is imperative that more skilled labor should be regularly employed, and a man of broad scientific culture placed at the head of the museum with its interests alone in charge; otherwise the very multitude of our Curators will become an evil and our best energies be wasted.

I trust these remarks will not seem misplaced or presumptuous. I could not refrain from speaking, as this may be my last opportunity and the interests of the Society are most dear to me. No one of my age has been connected so long or so intimately with its Council, and to no one have such weighty responsibilities been entrusted. I have endeavored, to the best of my poor ability, to prove worthy of your confidence, and faithfully to perform the duties to which you have called me; you are the judges in how far I have succeeded; and now that I am compelled to relinquish my charge after a varied service of more than ten years, I would bear glad testimony to the courtesy with which the difficulties of my official position have been smoothed, to the forbearance of the officers toward my imperfect service, and to your continued generous support. I should be false to myself if I did not add my public recognition of the entire faithfulness and thoroughness of the work of those who have been engaged to assist me in the various departments of the Society's operations; and to particularize in this imperfect praise

one whose service has been constant, multiform and invaluable for more than six years. With renewed thanks for your many kindnesses, and my most earnest wishes for the increased prosperity of our good Society, I bid you farewell.

LETTERS RECEIVED

DURING THE YEAR ENDING APRIL 30, 1870.

From the Academia Real das Sciencias de Lisboa, March 24th, 1868; Société Linnéenne de Bordeaux, April 6th, 1868; Accademia delle Scienze di Bologna, May 4th, 1868; Académie Royale, etc., de Belgique, Bruxelles, September 7th, 1868; Naturforschende Gesellschaft in Halle, September 9th, and October 20th, 1868; Naturforschende Gesellschaft in Zurich, September 30th, 1868; Naturforschender Verein in Brünn, October 28th, 1868; Bureau de la Recherche Géologique de la Suède, Stockholm, November 1st, 1868; Société des Sciences Naturelles de Neuchatel, November 15th, 1868; Naturforschende Gesellschaft in Danzig, November 30th, 1868; Gesellschaft für Ackerbau, etc., Brünn, December 1st, 1868; K. Akademie der Wissenschaften in Wien, December 14th, 1868; Schweizerische Gesellschaft für die gesammten Naturwissenschaften, Bern, January 1st, 1869; Naturforschende Gesellschaft in Bern, January, 1869; Essex Institute, Salem, Mass., March 22d, June 17th, September 30th, October 14th and 30th, November 17th, December 2d and 27th, 1869; Geological Museum, Calcutta, March 30th, 1869; Académie Royale des Sciences de Lisbonne, March 30th, 1869; Utrecht Society of Arts and Sciences, March, 1869; Société Impériale des Naturalistes de Moscou, April 9th, 1869; Naturhistorischer Verein der preussischen Rheinlande, etc., Bonn, April 15th, 1869; Smithsonian Institution, Washington, April 17th and 20th, and June 29th, 1869; Madras Literary Society, April 18, 1869; Lyceum of Natural History, New York, May 3d and 10th, and December 13th, 1869; Accademia delle Scienze, Bologna, May 9th, 1869; R. Istituto di Scienze, Lettere ed Arti, Venezia, May 17th, 1869; Gothenburg Society of Science and Literature, May 20th and September 18th, 1869; Mass. Horticultural Society, Boston, May 27th, 1869; American Philosophical Society, Philadelphia, June 26th, 1869; Academy of Sciences, Chicago, June 28th, 1869; Prof. James D. Dana, New Haven, July 13th, 1869; Dr. John Torrey, July 16th, 1869; Prof. J. W. Dawson, Montreal, July 17th, 1869; Naturforschende Gesellschaft, Danzig, July 24th, 1869; Prof. Joseph Henry, Smithsonian Institution, July 27th, 1869; Trustees of New York State Library, Albany, July 31st, 1869; Verwaltungs-Ausschuss des Ferdinandeums zu Innsbruck, August 1st, 1869; K. Sächsische Gesellschaft der Wissenschaften, Leipzig, August 13th, 1869; Vorarlberger Museums-Verein, Bregenz, August 14th, 1869; Naturhistorischer Verein, Dessau, August 16th, 1869; Leeds Philosophical and Literary Society, August 26th, 1869; Naturwissenschaftlicher Verein, Bremen, August 31st, 1869; Zoologisch-mineralogischer Verein, Regens-

burg, September 1st, 1869; Naturforschende Gesellschaft, Basel, September 11th, 1869; Liverpool Geological Society, September 17th, 1869; Naturforschende Gesellschaft in Halle, September 17th, 1869; Naturwissenschaftlicher Verein für das Fürstenthum Lüneburg, September 19th, 1869; India Museum, September 22d, 1869; Dr. H. B. Geinitz, Dresden, September 24th, 1869; Société des Sciences de Finlande, Helsingfors, September 24th, 1869; Naturhistorisch-medizinischer Verein, Heidelberg, September 30th, 1869; Natuurkundig Genootschap, Groningen, September, 1869; Société d'Agriculture, Sciences et Arts de la Sarthe, Le Mans, September, 1869; Lyceum of Natural History, New York, October 4th and 18th, 1869; Société d'Agriculture, etc., Tours, October 8th, 1869; Académie Royale des Sciences à Amsterdam, October 6th, 1869; Naturforschende Gesellschaft Graubündens, Chur, October 13th, 1869; K. Universitatsbibliothek, Kiel, October 15th, 1869; Verein der Aerzte in Steiermark, October, 1869; K. Gesellschaft der Wissenschaften zu Göttingen, October, 1869; Medizinisch-naturwissenschaftliche Gesellschaft zu Jena, November, 1869; Académie de Stanislas, Nancy, November 9th, 1869; Société Royale de Botanique de Belgique, Bruxelles, November 14th, 1869; Directors of Museum at Bergen, November 11th, 1869; McGill University, Montreal, November 19th, 1869; Journal de l'Agriculture, Paris, November 19th, 1869; Provinciaal Utrechtsch Genootschap van Kunsten, etc., Utrecht, November 24th, 1869; Massachusetts Historical Society, Boston, November 29th, 1869; General Theological Library, Boston, November 29th, 1869; New Hampshire Historical Society, Concord, N. H., November 29th, 1869; N. E. Historic-Genealogical Society, Boston, November 29th, 1869; Public Library of City of Boston, December 3d, 1869; Société Impériale des Naturalistes de Moscou, December 16th, 1869; York Institute, Saco, Me., December 7th, 1869; Senckenbergische naturforschende Gesellschaft, Frankfurt a. M., December 9th, 1869; Bureau de la Recherche Géologique de la Suède, December 10th, 1869; Editor of the Archiv für Naturgeschichte, 1869; Melbourne Public Library, Librarian of, December 22d, 1869; Naturhistorische Gesellschaft zu Nürnberg, December 25th, 1869; K. Danske Videnskabernes Selskab, Kjöbenhaven, December 31st, 1869; Accademia Gioenia di Scienze Naturali, Catania, 1869; Naturforschende Gesellschaft, Freiburg, January 10th, 1869; Essex Institute, Salem, Mass., January 18th, February 3d and 28th, March 21st and May 14th, 1870; Trustees of New York State Library, Albany, January 20th, 1870; American Philosophical Society, Philadelphia, January 21st, 1870; Smithsonian Institution, Washington, D. C., February 15th, 1870; Maryland Academy of Sciences, Baltimore, February 21st, March 2d and April 30th, 1870; Akklimatisations-Verein in Berlin, March 14th, 1870; Institute of Natural Science, Halifax, N. S., March 22d, 1870; Geological Survey of Canada, Montreal, March 30th, 1870; Library of Parliament, Ottawa, April 2d, 1870; Literary and Historical Society, Quebec, April 2d, 1870; University of Toronto, Librarian of, April 2d, 1870; Library of Parliament, Toronto, April 2d, 1870; Canadian Institute, May 4th,1870; Société des Sciences Naturelles, Neuchatel, 1870, acknowledging the receipt of the Society's publications.

From the Librarian of the British Museum, October 25th, 1865; Gelehrte Estnische Gesellschaft, Dorpat, February 18th, 1868, and October 22d, 1869;

Società Italiana di Scienze Naturali, Milano, June 15th, 1868; Royal Geographical Society, London, August, 1868; Naturforschende Gesellschaft, Zürich, September 30th, 1868; Bureau de la Recherche Géologique, Stockholm, November 1st, 1868; Société Entomologique des Pays-Bas, Leide, December 1st, 1868; Société Hollandaise des Sciences à Harlem, January 1st, 1869; K. Akademie der Wissenschaften, Wien, March 6th, 1869; Utrecht Society of Arts and Sciences, March 23d, 1869; Naturforschende Gesellschaft zu Halle, March 30th and August 25th and 30th, 1869; Académie Royale, etc., de Belgique, Bruxelles, April 1st, 1869; Bombay Geographical Society, April 1st, 1869; Société Royale de Zoologie à Amsterdam, May 31st, 1869; K. Svenska Vetenskaps Akademien, Stockholm, May and July, 1869; Naturforschende Gesellschaft, Bern, May, 1869; Schweizerische Naturforschende Gesellschaft, Bern, May, 1869; Historischer Verein, Ansbach, June 10th, 1869, and March 31st, 1870; Mittelrheinischer geologischer Verein, Darmstadt, July 3d, 1869; Royal Geographical Society, July, 1869; K. Preussische Akademie der Wissenschaften, Berlin, August 3d, 1869; Naturhistorischer Verein in Augsburg, August 4th, 1869; K. Sächsische Gesellschaft, Leipzig, August 13th, 1869; Mannheimer Verein für Naturkunde, August, 1869: Schlesische Gesellschaft für vaterländische Cultur, Breslau, September 1st, 1869; Société des Sciences de Finlande, Helsingfors, September 8th, 1869; Académie Royale des Sciences à Amsterdam, September 15th, 1869; L'Université de Leyde, October 13th, 1869; Museets Naturhistoriske Afdeling, Bergen, October 22d, 1869; Société scientifique de la Zélande à Middelbourg, November 23d, 1869: Senckenbergische naturforschende Gesellschaft, Frankfurt a. M., November, 1869; Utrecht Society of Arts and Sciences, November 24th, 1869; Universidad de Chile, Santiago, 1869; Teylers Stichting te Haarlem, 1869; Bataafsch Genootschap, etc., Rotterdam, 1869; Professor Dr. H. Löw, former director of the Realschule, Meseritz, December 15th, 1869; Professor Francesco Zantedeschi in Padova, December 16th, 1869; British Museum, February 23d and April 4th, 1870; Museum, Newcastle-upon-Tyne, March 11th, 1870; Museum of Comparative Zoölogy, Cambridge, Mass., May 12th, 1870; Società Italiana di Scienze Naturali, Milano, presenting their various publications.

From the Oberlausitzische Gesellschaft der Wissenschaften, Görlitz, November 20th, 1868; Gesellschaft naturforschender Freunde zu Berlin, January 18th, 1869; Naturwissenschaftlicher Verein für das Fürstenthum Lüneburg, February 23d, 1869; New York State Agricultural Society, Albany, April 7th, 1869; Königl. Böhmische Gesellschaft der Wissenschaften, Prag, April 8th, 1869; Société Impériale Géographique de Russie, St. Pétersbourg, May 15th, 1869; Nova Scotian Institute of Natural Science, Halifax, May 25th, 1869; Agricultural and Horticultural Society of India, Calcutta, June 21st, 1869; Prof. John Torrey, New York, July 16th, 1869; Royal Academy of Sciences, Stockholm, July 30th, 1869; Literary and Philosophical Society of Manchester, August 2d, 1869; Kaiserlich-Königliche Geologische Reichsanstalt, Wien, August 20th, 1869; Oberhessische Gesellschaft für Natur-und Heilkunde, Giessen, September 2d, 1869; Nederlandsche Entomologische Vereeniging, Rotterdam, September 7th, 1869; Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, Newcastle, September 13th, 1869; Cercle Artistique, Littéraire et

Scientifique d'Anvers, September 14th, 1869; Verein von Alterthumsfreunden im Rheinlande, Bonn am Rhein, September 24th, 1869; Linnean Society, London, September 25th, 1869; Verein nördliche der Elbe, Kiel, October 5th, 1869; Liverpool Geological Society, November 3d, 1869; Kongelige Norska Universitets, Christiania, November 29th, 1869; Académie des Sciences, Agriculture, Arts et Belles-Lettres d'Aix, December 30th, 1869; Verein "Lotos," Prague, January 21st, 1870, acknowledging the receipt of the publications of the Society and presenting their own.

From the Naturforschende Gesellschaft in Emden, 1869; North China Branch Royal Asiatic Society, Shanghai, July 19th, 1869; Bataafsch Genootschap der Prœfondervindelijke Wijsbegeerte te Rotterdam, August 25th, 1869; Société Botanique de France, Paris, 1869; Verein nördlich der Elbe, Kiel, October 5th, 1869; Dudley and Midland Geological and Scientific Society and Field Club, January 3d, 1870; Oberlausitzische Gesellschaft der Wissenschaften, Görlitz, January 18th, 1870; Verein zur Beförderung des Gartenbaues, Berlin, March 23d, 1870, acknowledging the publications of the Society and sending desiderata.

From the Royal Scottish Society of Arts, Edinburgh, March 1st, 1869; Isaac Lea, Philadelphia, July 24th, 1869; Société Impériale d'Émulation, Abbeville, November 3d, 1869; Société Paléontologique de Belgique, Anvers, December 23d, 1869; British Museum, January 15th, 1870, acknowledging the publications of the Society, and promising to send their own.

From the Utrecht Society of Arts and Sciences, November 25th, 1869, sending their recent publications, and offering to send the Verhandlungen of the Belles-Lettres and Political Economy Sections, if we desire them.

From the Revue des Cours Littéraires et Scientifiques, Paris, January 3d, asking for exchange, and March 28th, 1870, thanking for assent to their request.

From the Società Italiana di Scienze Naturali, Milano, March 28th, 1868, and June 2d, 1869; Société Linnéenne de Lyon, March, and November 15th, 1869; Königlich Bayerische Akademie der Wissenschaften, München, March 6th, and December 1st, 1869; Naturforscher-Verein zu Riga, May 17th, 1869; J. Joseph Bianconi, Bologna, June 23d, 1869; Bombay Geographical Society, August 27th, 1869; Naturwissenschaftlicher Verein, Bremen, September 1st, 1868; Zoölogical Society of London, November 5th, 1869; Naturforschende Gesellschaft zu Bamberg, 1869; Société d'Émulation de Doubs, Besançon, December 11th, 1869; Société Entomologique de France, Paris, February 7th, 1870, acknowledging the publications of the Society, presenting their own, and requesting that deficient parts may be supplied.

From the Entomologischer Verein, Stettin, September, 1869; Scientific Opinion, London, October 8th, 1869, asking for publications and deficient parts.

From the Kaiserlich-Königliche Geologische Reichsanstalt, Wien, October 9th, 1858; Geological and Polytechnic Society of the West Riding of Yorkshire, Leeds, November 16th, 1868; Geological Survey of India and Geological Museum of Calcutta, April 14th, 1869; Société des Sciences Physiques et Naturelles de Bordeaux, April 29th, 1869; Société Impériale d'Agriculture, d'Histoire Naturelle et des Arts Utiles de Lyon, July 12th, 1869; Zoölogical Society of London, January 13th, 1870; Royal Society of Edinburgh, 1870, acknowledging the receipt of the publications of the Society, sending their own, and regretting their inability to supply deficiencies.

From the Bureau de la Recherche Géologique de la Suède, Stockholm, November 1st, 1868, asking and acknowledging the publications of the Society, and announcing donations.

From Mr. Lewis H. Morgan, Albany, N. Y., February 16th, 1869, presenting thanks for corresponding membership and credentials.

From the Edinburgh Geological Society, April 8th, 1869, presenting publications and asking for those of the Society in exchange.

From the Società Ligure di Storia Patria, Genova, May 20th, 1868, acknowledging the receipt of publications of the Society and promising to send its own, and asking for those promised but not received.

From the Museo di Storia Naturale della R. Universita di Bologna, July 8th, 1869, acknowledging the receipt of books from the Society, the Secretary promising to send his own publications in exchange, as none are issued by those departments of the University.

From the Naturforschende Gesellschaft Graubündens, Chur, September 15th, 1869, announcing the death of the Vice President, Herr Gottfried Theobald, Professor der Naturwissenschaften an der graubündernischen Kantonsschule.

From the Verein der Aerzte in Steiermark, Graz, October 2d, 1869, communicating through the Society with the Surgeon General of the United States.

From Prof. J. Capellini of the University of Bologna, November 12th, 1869, presenting his thanks for diploma of corresponding membership.

From the Maryland Academy of Sciences, Baltimore, December 16th, 1869, announcing the organization of that body, and requesting friendly relations with the Society.

From the Royal Geographical Society, London, 1869, asking for local information.

From the Naturforscher Verein zu Riga, January 12th, 1870, announcing, and inviting the Society to be present at, the observance of its twenty fifth anniversary.

From the Gesellschaft zur Beförderung der gesammten Naturwissenschaften in Marburg, January, 1870, presenting their publications, and also desiderata out of print which they have discovered and purchased for the Society, at the bookstores.

From Dr. Felix Flügel, March 3d, 1870, and M. G. von Niepl, February 28th, 1870, Secretary of the Society of Natural Sciences at Brünn, announcing the dissolution of the Werner Verein in Brünn.

From the Nederlandsche Maatschappij ter bevordering van Nijverheid, Haarlem, 1870, announcing the offer of a premium for the best method of lighting Buoys for night-service.

ADDITIONS TO THE LIBRARY

DURING THE YEAR ENDING APRIL 30, 1870.

Contributions to the Mineralogy of Nova Scotia. By Professor How. IV. 8vo. Pamph. 1869. *From the Author.*

A Guide to the Study of Insects. By A. S. Packard, Jr., M. D. Parts VII–X. 8vo. Salem, 1869. *From the Author.*

Appendix to Report on Mollusca. By E. S. Morse. 8vo. Pamph. Salem, 1869. *From the Author.*

I. Réapparition du Genre Arethusina Barr. II. Faune Silurienne des Environs de Hof, en Bavierre. Par Joachim Barrande. 8vo. Paris, 1868. *From the Author.*

Lepidopterological Miscellanies. By Coleman T. Robinson. 8vo. Pamph. New York, 1869. *From the Author.*

Modern Ideas of Derivation. Address of Principal Dawson, as President of the Natural History Society of Montreal, May 18, 1869. 8vo. Pamph. *From the Author.*

An Examination of the Hypothesis of Central Heat in the Earth, and of the assumed Connection of Volcanoes and Earthquakes therewith. By R. W. Haskins, A. M. 8vo. Pamph. Buffalo, 1869. *From the Author.*

Prodromus of a Study of North American Fresh Water Algæ. By Dr. Horatio C. Wood, Jr. 8vo. Pamph. Philadelphia, 1869. *From the Author.*

First Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri. By Charles V. Riley. 8vo. Jefferson City, 1869. *From the Author.*

An Address on the Occasion of the Hundredth Anniversary of the Birth of Alexander von Humboldt. By James P. Luse, A. M. 8vo. Pamph. New Albany, Ind., 1869. *From the Author.*

On some Elementary Principles in Animal Mechanics. By the Rev. Samuel Haughton, M. D. 8vo. Pamph. *From the Author.*

Catalogue and Synonymy of the Genera, Species and Varieties of Recent Mollusca, described prior to January 1, 1867. By S. R. Roberts. Part IV. 8vo. Philadelphia, 1869. *From the Author.*

Mammalia of Massachusetts. By J. A. Allen. 8vo. Pamph. Cambridge, 1869. *From the Author.*

Geological Report of the Exploration of the Yellowstone and Missouri Rivers. By Dr. F. V. Hayden, Assistant. 1859–60. 8vo. Washington, 1869. *From the Author.*

La Teoria delle Associazioni Poligeniche applicata allo Studio dei Silicati.

Dal Prof. Cav. Luigi Bombicci. 8vo. Pamph. Bologna, 1868. *From the Author.*

I Corpi Considerati come Chimiche Individualità, etc. Dal Dr. Antonio Mazzoni. 8vo. Pamph. Faenza, 1868. *From the Author.*

Alla Memoria di Giuseppe Stabile. Antonio Stoppani. 4to. Pamph. *From the Author.*

The Antiquity of Man in America. By William Gossip. 8vo. Pamph. Halifax, N. S., 1869. *From the Author.*

Contributions to the Geology of Ohio. By Col. Charles Whittlesey. 8vo. Pamph. Cleveland, 1869. *From the Author.*

The Water-Power of Maine. By Walter Wells. 8vo. Augusta, 1869. *From the Author.*

On Dakosaurus from the Kimmeridge Clay of Shotover Hill. By J. Wood Mason, Esq. 8vo. Pamph. London, 1869. *From the Author.*

On the Anatomy of Balænoptera rostrata. By Alexander Carte and Alexander Macalister. 4to. Pamph. London, 1868. *From the Author, Dr. Carte.*

The Geology of the New Haven Region, with special reference to the Origin of its Topographical Features. By James D. Dana. 8vo. Pamph. New Haven, 1870. *From the Author.*

Contributions to the Natural History of Nova Scotia. By J. Matthew Jones, F. L. S. Insecta. Coleoptera, Part I. 8vo. Halifax, 1870. *From the Author.*

Verzeichniss der Käfer Deutschlands von Dr. G. Kraatz. 8vo. Pamph. Berlin, 1869. *From the Author.*

Sur les Insectes fossiles du Calcaire lithographique de la Bavière, qui se trouvent au Musée Teyler; par H. Weyenbergh, Jr. 8vo. Pamph. Harlem, 1869. *From the Author.*

Annual Report of the State Geologist of New Jersey, for 1869. By Geo. H. Cook. 8vo. Pamph. Trenton, N. J., 1870. *From the Author.*

Land and Fresh Water Shells of North America, Part I. By W. G. Binney and T. Bland. 8vo. Washington, 1869. *From the Authors.*

Flora Brasiliensis; ediderunt Carolus Fridericus Philippus de Martius. Fasc. XLVII, XLVIII. Folio. Lipsiæ, 1869. *From Mrs. B. D. Greene.*

The American Monthly Magazine. N. S., Vol. I, April—June, 1836; II, Aug., Sept., 1836; III, Jan.—April and June, 1837; IV, July, Aug., Nov., Dec., 1837. 8vo. Boston and New York. *From Miss Joy.*

Revue des Cours Scientifiques de la France et de l'Étranger. 7e Année, No. 3. 4to. Paris, 1869. *From Professor Agassiz.*

Two Photographs of the "Cushing" Elm, in Hingham. *From Mr. F. U. Tracy.*

Franklin Society Publications. I. The Printer. By James W. Sheahan. 4to. Pamph. Chicago, 1869. *From the Franklin Society of Chicago.*

Bibliotheca Historico-Naturalis. Jahrg. XVIII, Heft 2; XIX, 1. 8vo. Göttingen, 1869. *From Mr. L. W. Schmidt.*

The Hingham Journal. Vol. XX, No. 26. Folio, 1869. *From Mr. T. T. Bouvé.*

Memoir of George Livermore. By Charles Deane. 8vo. Pamph. Cambridge, 1869. *From Rev. R. C. Waterston.*

Annual Reports of the Superintendent of Public Instruction of the State of New York, 11th, 13th–15th. 8vo. Albany, 1865, 1867–9. *From Hon. A. B. Weaver.*

Observations sur diverses Diatomées servant de Tests. Par E. Hartnack. 8vo. Pamph. Anvers, 1865. *From Mr. C. Stodder.*

Catalogue of the Officers and Students in Yale College, 1869–70. 8vo. Pamph. New Haven, 1869. *From the Trustees.*

Forty-sixth Annual Report of the Mercantile Library Company of Philadelphia. 8vo. Pamph. January, 1869. *From the Company.*

Prang's Chromo Journal. Nos. 1–5. 4to. Boston, 1868, 1869. *From Mr. L. Prang.*

Medallion of J. E. and M. E. Gray. *From Dr. J. E. Gray.*

The History and Development of Races. Annual Address before the State Historical Society of Wisconsin, Feb. 23, 1869. By Hon. Harlow S. Orton. 8vo. Pamph. Madison, 1869. *From the Society.*

British Butterflies. By W. S. Coleman. 16mo. London, 1862. *From Mr. C. S. Minot.*

L'Organization du Règne Animal par Émile Blanchard. Arachnides, Livr. 1–18. 4to. Paris, 1852. *From Mr. Wm. Holden.*

Stereograph of the Fertile and Sterile Fronds of a fringed and tufted Fern found in Wilton, N. H. *From Mr. Wm. Edwards.*

Eighteenth Annual Report of the Trustees of the Free Public Library of the City of New Bedford. 8vo. Pamph. 1870. *From the Trustees.*

Third Report of the Commissioners of Fisheries of the State of Maine, 1869. 8vo. Augusta, 1870. *From Mr. Chas. G. Atkins.*

Report of the Commissioners of Fisheries for the year ending January 1, 1870. 8vo. Pamph. Boston. *From Mr. Theodore Lyman.*

Report on the Invertebrata of Massachusetts, published agreeably to an Order of the Legislature. Second Edition, comprising the Mollusca. By Augustus A. Gould, M. D. Edited by W. G. Binney. 8vo. Boston, 1870. *From the Commonwealth of Massachusetts.*

The Fibre Plants of India, Africa and our Colonies. By James H. Dickson. 8vo. London. *From Mr. C. J. Sprague.*

Supplement to the Catalogue of Books in the Mercantile Library of the City of New York. 8vo. 1869. *From the Mercantile Library Association.*

Report on the Lewis Gold Mine, White County, Georgia. Made by Adelberg and Raymond. 8vo. Pamph. New York, 1866. *From Dr. S. Kneeland.*

Fourteenth and Fifteenth Annual Reports of the Board of St. Louis Public Schools, 1867–8, 1868–9. 8vo. *From the Public School Library Society.*

Experiments upon the Physiological Action of Bromide of Potassium and Ammonium. By Robert Amory, M. D. 8vo. Pamph. Boston, 1869.

A Contribution to the Physiological Study of Veratrum viride and Veratria. By the same, and S. G. Webber, M. D. 12mo. Pamph. Boston, 1869. *From the Author, Dr. Amory.*

The Surface Geology of the Basin of the Great Lakes and the Valley of the Mississippi. By J. S. Newberry, M. D. 8vo. Pamph. New York, 1869.

The Geological Survey of Ohio; its Progress in 1869. By the same. Address to the Legislature, February 7, 1870. 8vo. Pamph. New York. *From the Author.*

Observations on the Genus Unio. By Isaac Lea. Vol. III. Index to Vol. XII and Supplementary Index to Vols. I–XI, Vol. II. 4to. Philadelphia, 1869.
Notes on Microscopic Crystals included in some Minerals. By the same. 8vo. Pamph. Philadelphia, 1869. *From the Author.*

Origine de la Navigation et de la Pêche, par Gabriel de Mortillet. 8vo. Pamph. Paris, 1867.
L'Époque quaternaire dans la Vallée du Pô. By the same. 8vo. Pamph. Paris, 1864. *From the Author.*

Morphologische, Anatomische und Physiologische Fragmente. Von Paul Reinsch. 8vo. Pamph. Moskau, 1865.
Die Meteorsteine. By the same. 4to. Pamph. 1869. *From the Author.*

First Annual Report upon the Geology and Mineralogy of the State of New Hampshire. By C. H. Hitchcock. 8vo. Pamph. Manchester, 1869.
The Elevation of Mountains. By the same. 8vo. Pamph. Hanover, N. H., 1870. *From the Author.*

On the Meteoric Stone which fell December 5th, 1868, in Franklin County, Alabama. By George J. Brush. 8vo. Pamph. New Haven, 1869.
On Durangite, a Fluo-arsenate from Durango in Mexico. By the same. 8vo. Pamph. New Haven, 1869. *From the Author.*

Additamenta ad Historiam Ophiuridarum. Af Chr. Fr. Lütken. 4to. Pamph. Kjöbenhavn, 1869.
Om Ganoidernes Begrændsning og Inddeling. By the same. 8vo. Pamph. Kjöbenhavn, 1869. *From the Author.*

Intorno ad Alcuni Insetti perforatori dei Metalli. Memoria del Dottor Gian Antonio Bianconi. 4to. Pamph. Bologna, 1867.
Sul Rhynchoprion columbae Hermann o Argas reflexus Latr. By the same. 4to. Pamph. Bologna, 1867. *From the Author.*

Description d'une nouvelle Espèce Américaine du Genre Caiman (Alligator), par M. Alf. Preudhomme de Borre. 8vo. Pamph. Bruxelles, 1869.
Description d'un jeune Individu de la Dermatemys mawii. By the same. 8vo. Pamph. Bruxelles, 1869. *From the Author.*

Report on the Waverley Gold District, with Geological Maps and Sections. By Henry Youle Hind, M. A. 8vo. Pamph. Halifax, N. S., 1869.
Preliminary Report on a Gneissoid Series underlying the gold-bearing Rocks of Nova Scotia. By the same. 8vo. Pamph. Halifax, N. S., 1870. *From the Author.*

Description of a new species of Protichnites from the Potsdam Sandstone of New York. By O. C. Marsh. 8vo. Pamph. New Haven, 1869.

Notice of some new Mosasauroid Reptiles from the Greensand of New Jersey, etc. By the same. 8vo. Pamph. New Haven, 1869.

On the Preservation of Color in Fossils from Palæozoic Formations. By the same. 8vo. Pamph.

Notice of some Fossil Birds from the Cretaceous and Tertiary Formations of the United States. By the same. 8vo. Pamph. New Haven, 1870. *From the Author.*

Untersuchungen über die Gattung der Klippsschliefer (Hyrax herm). Von Johann Fr. Brandt. 8vo and 4to. Pamphs. St. Petersburg, 1869.

De Dinotheriorum Genere Elephantidorum Familiæ adjungendo, etc. By the same. 8vo and 4to. Pamphs. St. Petersburg, 1869.

Wenige Worte in Bezug auf die Erwiderungen in Betreff der Vertilgung der Nordischen Seekuh. By the same. 8vo. Pamph. Moskau, 1868.

Einige Worte über die europäisch asiatischen Störarten (Sturionides). By the same. 8vo. Pamph. St. Petersburg, 1869. *From the Author.*

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ADDITIONS TO THE MUSEUM

DURING THE YEAR ENDING APRIL 30, 1870.

May 11, 1869. Snake from the Gulf of Tonquin, China; scorpion from the W. I., by Wm. Hovey.

May 12. Nine specimens of birds from Hardwick, Mass., by Sam'l Mixter. Humming bird from Framingham, Mass., by Jas. W. Clark.

May 18. Sixteen species of marine mollusca from Florida and Gulf of Mexico, determined and given by Robt. E. C. Stearns.

May 26. A Gar-pike and Lota from Lake Champlain, and a *Nereis* from Beverly, by Mr. Thos. Lee. A living female Opossum and nine young from Cheraw, S. C., by Dr. C. Kollock. Fresh female specimen of *Dendroica cœrulescens* Coues, from Newton, Mass., by H. A. Purdie.

May 31. Thirty-six skins of birds, five mammals, etc., from Alaska, by the Smithsonian Institution.

June 6. Chicken snake by C. S. Minot. Coleoptera and Diptera from Dorchester, by F. A. Clapp, and two thousand three hundred insects from Natick, Mass., by Mrs. Martha W. Stratton.

June 16. Bird's nest from N. Wrentham, by Miss S. S. Bonney. Skins of Massachusetts birds, by H. A. Purdie. *Saperda calcarata*, etc., from Newton Corner, by Dr. G. F. Waters. *Vanessa antiopa* from Lexington, by C. A. Wellington. *Phrynosoma cornuta* from Texas, by Mrs. Dearborn.

June 19. Nests and eggs from South Carolina, by Ben. P. Mann.

June 29. Fossil Neuroptera of the Devonian from Lancaster, N. B., by Prof. C. F. Hartt. Samples of mud and vertebræ of a Cetacean from the Rappahannock, by C. P. Dillaway. Alligator, by Dr. B. S. Codman.

July 1. Reptiles from South Carolina, by B. P. Mann. Mandrill from Mr. Cullen.

July 21. Asbestos by James Ball. Birds from Sherborn, Mass., by A. L. Babcock. Limax by Mr. Byatt. Actinolite from Reading, Vt., by W. W. Culver.

Aug. 5. Lepidoptera from Lynn, Mass., by W. H. Dall. Diptera from California, by W. H. Dall.

Aug. 11. *Carduelis tristis*, etc., from Somerville, by C. W. Costellow. Radiata from various localities, by A. E. Verrill. Nests and eggs of insects and birds from Wrentham, Mass., by Luther Hills. Nests of various species from Andover, Mass., by C. Martin. Nest from Andover, y C. S. Smith. Fossils from Springfield, Ohio, by Jas. Couhig. *Mephitis* from Greenwood, Mass., by Geo. Coles.

Aug. 27. Sword of sword fish from Greenland, by C. W. Tufts.

Aug. 31. *Amblystoma* from Brookfield, Mo., by E. P. Austin. Alligator from New Orleans, by Mrs. Webber. *Plestiodon fasciatus* from New Bedford, Mass., by J. A. Allen.

Sept. 10. Fungi from Dorchester, Mass., by C. C. Stimpson.

Sept. 13. Eggs of *Ophibolus eximius* from Walpole, Mass., by S. E. Stone. Diptera from Behrings Sea, by W. H. Dall.

Sept. 16. Sponges from the Mediterranean, by R. R. Brown. Larvæ of *Citheronia* from Newton, Mass., by Dr. G. F. Waters.

Sept. 25. *Gordius* from Rindge, N. H., by C. E. Ware. Siren from Colorado, by Geo. J. Dickinson. Larvæ of *Vanessa* from Mass., by S. H. Scudder. Snakes, fishes, and insects from Calcutta and Ceylon, by Henry R. Williams.

Sept. 27. Fossil ferns, etc., from Mazon Creek, Ill., by Davenport Academy of Sciences. *Tetrao urogallus* from the Pyrenees, by R. B. Forbes. *Eutænia sirtalis*, by Dr. Bemis. Quartz from Thornton, N. H., by C. S. Minot. Limax from Newton, Mass., by H. A. Purdie. Limestone from St. Anthony, Min., by Geo. Carpenter. *Platyphyllum* from Mount Tom, Mass., by T. D. Smith. Lepidoptera from Cambridge, Mass., by Chas. Wright.

Oct. 5. *Triton* from Medford, by F. G. Sanborn.

Oct. 7. Coot from Mass., by C. F. Shimmin. *Diapheromera femorata* Say, from Medford, Mass., by H. A. Bailey.

Oct. 14. *Unionidæ* from Cedar River, Iowa, by John King.

Oct. 15. Sandstones from Holland and Scotland, by J. S. Mendels.

Oct. 20. Egg of Ostrich from Africa; nests of native birds, etc., from Massachusetts, by Ernst Papendiek. Quartz from Chelsea, Vt., by Thomas Gaffield.

Oct. 25. *Ilex* from Massachusetts, by Dr. S. Kneeland. *Bryozoa* from Atlantic City, N. J., by L. B. Felt. Seeds from summit of the Andes, in Chili, by Dr. S. Kneeland. Sponges from Massachusetts, by O. P. Allen. Sponges from Cuba, by Samuel H. Scudder.

Oct. 28. Orthoptera and Reptilia from Fort Macon, N. C., by Dr. E. Coues. Fishes and turtles from Cohasset, Mass., by Dr. S. Kneeland. Plants of various kinds from Germany, by Paul Reinsch. Cannel Coal from England, by F. G. Merriam. Plants, mollusca, and minerals from various localities, by Samuel Wells, Jr. Shells from Cape Flattery, by H. O. Preble.

Nov. 1. Birds from Colorado, by F. E. Everett. Copper ores from West Mass., by F. E. Everett.

Nov. 4. Mink from Massachusetts, by Dr. J. B. S. Jackson. Boa by Benj. Eston.

Nov. 10. Seal from the Antarctic Ocean, by the Smithsonian Institution. Coleoptera and a scorpion from Santa Croix, W. I., by Samuel Wells, Jr.

Nov. 11. North American mosses, by L. Lesquereux. Scales of Lepisma, by E. Samuels.

Nov. 15. Shells from the Hawaiian Islands and California, two species of Coral from Hawaiian Islands, etc., by W. T. Brigham. Salamander from Massachusetts, by J. C. Higgins.

Nov. 17. *Sphærium* from West Newton, by Dr. G. F. Waters.

Nov. 20. A general collection of Fossils, Minerals, Corals, Reptiles, Fishes and Mammals, by John Parkman.

Nov. 25. Eels from Chiltonville, Massachusetts.

Nov. 29. Soundings off coasts of Maryland and Virginia, by C. P. Dillaway. Insects, also, by C. P. Dillaway.

Dec. 9. *Scolopendra* from Massachusetts, by N. M. Lowe. Albert Coal, by F. G. Merriam. Shark's Jaw from Bermuda, by Edwin Bicknell. Rattle of *Crotalus* from Groton, Mass., by Dr. S. A. Green. Tin Ore and several specimens of Native Carbonate of Magnesia from various localities, by Dr. C. T. Jackson.

Dec. 14. Birds from Massachusetts, by C. S. Minot. Fossils from Columbia, N. H., by S. H. Huntington. Iron pyrites, by Mr. Willard. Tin ores from Winslow, Me., by Dr. C. T. Jackson.

Dec. 16. *Colias* from Akyab, on the coast of Arracan, by W. T. Brigham. Skeleton of fœtal mouse, by J. L. Little, Jr. Head of red-tailed hawk from Waltham, Mass., by J. C. Stimpson.

Dec. 18. Galena from Wisconsin, by W. E. Coffin.

Dec. 22. Native copper and silver from Lake Superior by W. E. Coffin. *Acrocinus longimanus* from Brazil, by Hollis Thayer.

Dec. 23. Bark and wood of *Sequoia* from California, by J. G. Dow. A collection of birds' eggs from Europe, by Dr. T. M. Brewer.

Dec. 30. Moss agates from Rocky Mountains, by Geo. H. Preble.

Jan. 3, 1870. *Astur atricapillus* from Wood's Hole, Mass., by Jos. S. Fay. A large collection of insects from Santa Domingo and Tehuantepec, by Dr. F. Sumichrast.

Jan. 9. Insects of various orders from Cambridge, Mass., by S. H. Scudder. *Asellus* from Cambridge, Mass., by Edward Burgess. *Clava leptostyla* from Beverly, Mass., by Edward Burgess. *Fulgora* and *Phrictus* from the headwaters of the River Amazon, by S. H. Scudder.

Jan. 14. Section of an *Ammonite* from England, and a *Trilobite* from Locust Springs Hospital, Md., by H. J. Bowditch.

Jan. 19. Shingle from the *Sequoia* from Sonoma, Cal., by J. S. Dow. *Pteropus rubricollis* from Calcutta, by Capt. Albert Lewis. *Staurolite* and *Garnet* in *Hornblende* from Franconia, N. H., by H. F. Goodman. Duck from Massachusetts, by J. Galvin. Bald eagle from Quincy, Mass., by N. B. Furnald. Rock from the Island of Chittapittai, by Dr. S. Cabot.

Jan. 29. *Hymenoptera*, *Diptera*, etc., from Cambridge, Mass., by S. H. Scudder.

Feb. 2. Spider, N. W. Coast of Africa, by W. S. Tower. *Pteromys volucella* from Hardwick, Mass., by Geo. Mixter.

Feb. 12. Specimens of fossils and Radiata from San Francisco, and Mollusca and Insects from various localities, by Henry Edwards. *Micaceous concretions* from Ryegate, Vt., by Jonas H. Priest.

Feb. 14. Nests of two birds from Cambridge, Mass., by F. P. Atkinson. Part of sup. maxillary and tusks of walrus from Gulf of St. Lawrence, by Gideon Rowley.

Feb. 16. *Hymenoptera* from Mexico, by S. H. Scudder. Rocks and fossils from Gay Head, by J. C. Perry. Nests of birds from Florida, by Geo. Mixter.

Feb. 26. Eggs of tortoises and serpents from Florida, by Samuel Pasco. *Dianous chalybeus* from Lake Superior, by F. G. Sanborn. Nests and eggs of

birds from Florida, by Samuel Pasco. Nests and eggs of birds from Minnesota and Monterey, Cal., by Dr. T. M. Brewer. Book eaten by insects, by W. T. Brigham.

March 1. Nest and eggs of hermit thrush from Lynn, by S. O. Welch. Nest of *Trochilus colubris* from Winchester, Mass., by J. C. Mason. Stalactites from Proctor's Cave, Ky., by the same. Cuttle fish from Kaui, by S. B. Dole.

March 3. Fibre and bulb of soap plant from California, by J. S. Dow. Bird skins from Kodiak, by the Smithsonian Institution.

March 4. Terrapins from New Bedford, Mass., by R. C. Ingraham. Shells from Great Britain, by the Smithsonian Institntion.

March 12. Nests of wasps, by Wm. Edwards. Cells of Hymenoptera in apple wood, from Dorchester, Mass., by F. A. Clapp.

March 18. Imago and Cocoon of *Selandria*, by S. H. Scudder. Insects and reptiles from Caibarien, Cuba, by N. H. Bishop.

March 28. Canine monstrosity, by F. W. Barton. *Mutilla* and *Prionotus* from Clarksville, Tenn., by H. R. Bryant. Tortoise from Reed's Ferry, N. H., by A. K. Adams.

March 30. Lump fish and star-nosed mole from Plymouth, Mass., by T. M. Coffin.

April 5. Eggs of birds, etc., by S. W. Johnson. Tumor from stomach of haddock, by N. E. Atwood.

April 8. *Trichinæ* by Dr. F. Nickerson. Larvæ of insects from Lowell, Mass., by W. T. Brigham.

April 20. Lobster from Provincetown, Mass., by N. E. Atwood. Insects from Hardwick, Mass., by Geo. Mixter. *Aix sponsa*, by W. T. Brigham. Crystals of quartz from Ashland, Mass., by J. Carson.

April 29. Radiata from La Paz, Cal., by Museum of Yale College. Stalactites, etc., from the Caves of Cajuanes, and Radiates, Articulates, etc., from Remedios, Cuba, by N. H. Bishop. *Coccus* on the currant, by F. G. Sanborn. Cocoons of *Prometheus*, etc., from W. Newton, by Dr. G. F. Waters, and the same from Jamaica Plain and Nahant, by C. S. Minot.

DEPARTMENT OF ORNITHOLOGY.

AMERICAN.

Aquila canadensis.
Syrnium cinereum.
Surnia ulula.
Geococcyx californicus. n. e.
Hylotomus pileatus.
Selasphorus platycercus. n.
Milvulus tyrannus.
Sayornis sayus. n. e.
Contopus Richardsonii. n. e.
Empidonax obscurus. n. e.
Geothlypis Macgillivrayi Baird. n. e.
Vireo altiloquus. n.
Collurio elegans. n. e.
Collurio dendroica. n.
Vireo Swainsonii. n.
Oreoscoptes montanus. n.
Harporhynchus cinereus. n. e.
Salpinctes obsoletus. n. e.
Thryothorus Bewickii.
Troglodytes Parkmanni. n.
Chamaea fasciata. n.
Sitta pusilla.

Eremophila cornuta. n. e.
Carpodacus Cassinii Baird. n. e.
Aegiothus exilipes Coues.
Leucosticte griseinucha. n. e.
Melospiza Heermanni. n. e.
Melospiza fallax. n. e.
Passerella schistacea Baird. n. e.
Cyanospiza cyanea. n.
Pipilo oregonus. n. e.
Pipilo megalonyx. n.
Quiscalus major Viell. n.
Corvus caurinus Baird.
Cyanocitta californica. n.
Cyanura macrolophus. n.
Melopelia leucoptera. n.
Chamæpelia pallescens Baird.
Tetrao Richardsonii
Pediœcetes columbianus.
Bonasa umbelloides.
Lagopus rupestris.
Lophortyx Gambelii
Callipepla squamata.
Squatarola helvetica.
Strepsilas melanocephala
Phalaropus fulicarius.
Rallus crepitans. n.
Dendrocygna fulva.
Bucephala islandica Baird.
Larus smithsonianus Coues.
Chroicocephalus minutus.
Mergulus alle.

EUROPEAN.

Gyps fulvus.
Aquila imperialis.
Aquila pennata.
Pandion haliætus.
Buteo ferox.
Milvus aegypteus.
Falco subbuteo.
Falco Eleonoræ.
Falco vespertinus.
Otus brachyotus.
Merops ægyptius.
Cannabina linota. n.
Passerina melanocephala.
Alauda brachydactyla.
Budytes Rayii.
Motacilla sulphurea.
Turdus iliacus.
Turdus merula. n.
Turdus musicus. n.
Curruca nisoria.
Aedon galactodes.
Troglodytes borealis.
Lusciniopsis fluviatilis.
Pœcile palustris.
Pterocles arenarius.
Lagopus albus.
Bonasa sylvestris.
Otis tarda.
Charadrius philippinus.
Charadrius cantianus.
Chetusia gregaria.
Strepsilas interpres.
Numenius phœopus.
Pelidna melanotus.
Ardeola Sturmi.
Falcinellus igneus.
Phœnicopterus roseus.
Larus minutus.
Sterna anglica.
Sterna Dougallii.
Hydrochelidon hybrida.
Cygnus mansuetus.
Anser erythropus.
Tadorna casarca.
Querquedula circia.
Branta rufina.
Fuligula ferina.
Fuligula nyroca.
Podiceps nigricollis.
Podiceps arcticus.
Uria troile
Uria ringvia.
Uria arra.

AFRICAN.

Neophron pileatus.
Vultur Kolbii.
Buteo jackal.
Aquila pennata.
Chiquera typus.
Tinnunculus rupicolus.
Tinnunculus guttatus.
Tinnunculus rupicoloides.
Accipiter rufiventris.
Astur musicus.
Serpentarius reptilivorus.
Circus ranivorus.
Circus maurus.
Bubo maculosus.
Bubo sibiricus.
Cypselus cafer.
Hirundo capensis.
Hirundo dimidiata.
Cotyle fuligula.
Merops apiaster.
Upupa minor.
Nectarinea chalybea.
Nectarinea famosa.
Drymoica ocularius.
Drymoica substriata.
Drymoica subruficapilla.
Drymoica capensis.
Drymoica thoracica.
Calamodyta gracilirostris.
Bradypterus coryphœus.
Saxicola pileata.
Saxicola monticola.
Saxicola infuscata.
Saxicola sperata.
Saxicola pollux.
Saxicola sinuata.
Paroides capensis.
Parisoma Layardii.
Motacilla capensis.
Anthus capensis.
Turdus olivaceus.
Petrocincla rupestris.
Bessonornis phœnicurus.
Pycnonotus nigricans.
Lanius collaris.
Telophonus bacbakiri.
Laniarius silens.
Corvus capensis.
Juida bicolor.
Juida morio.
Hyphantornis capensis.
Hyphantornis capitalis.
Ploceus capensis.
Ploceus oryx.
Estrelda astrild.
Fringilla canicollis.
Fringilla striaticeps.
Passer arcuatus.
Fringillaria vittata.
Alauda crassirostris.
Megalophonus cinereus.
Megalophonus guttatus.
Certhilauda garrula.
Certhilauda africana.
Crithagra Selbyii.
Crithagra butyracea.
Colius erythropus.
Colius striatus.
Columba guineæ.
Columba arquatrix.
Œnas capensis.
Turtur semitorquatus.
Turtur senegalensis.
Francolinus clamator.
Francolinus afer.
Francolinus Levaillantii.
Coturnix dactylisonans.
Pterocles tachypetes.
Pterocles variegatus.
Eupodotis caffra.
Eupodotis scolopacea.
Eupodotis afra.
Struthio camelus.
Oedicnemus maculosus.
Hoplopterus coronatus.
Charadrius tricollaris.
Anthropoides Stanleyanus.
Ardea atricollis.
Scopus umbretta.
Fulica cristata.

Anas erythrorhyncha.
Anas flavirostris.
Rhynchopsis capensis.
Puffinus cinereus.
Diomedea exulans.
Lestris antarcticus.
Larus dominicanus.
Onychoprion fuliginosus.
Anous stolidus.
Podiceps cristatus.
Spheniscus demersa.
Aptenodytes chrysocoma.
Plotus Levaillantii.
Graculus africanus.
Graculus lucidus.

SOUTH AMERICAN.

Psittacus passerinus.
Cinchlorhynchus brevirostris.
Tyrannus cajana.
Saurophagus pitangua.
Troglodytes platensis.
Troglodytes hornensis.
Turdus magellanicus.
Turdus rufiventris.
Diplopterus guira.

AUSTRALIAN.

Melopsittacus undulatus.
Nymphicus novæ-hollandiæ.

REPORT OF THE TREASURER

FOR THE YEAR ENDING APRIL 30, 1870.

Mr. Edward Pickering presented the following report of the Treasurer for the past year:—

The Receipts and Expenditures for the year have been as follows:

Receipts.			
Dividends and Interest			$7,856.90
Courtis Fund Income			666.91
Pratt " "			446.00
Wolcott " "			570.00
Walker " " (one half.)			1,233.16
Annual Assessments			1,345.00
Admission Fees			125.00
Life Membership			100.00
Total			$12,342.97
Expenditures.			
Cabinet		$925.34	
Library		943.08	
Publications	$1,571.51		
Less receipts from sales	1,194.00		
		377.51	
Gas		135.51	
Fuel		631.30	
Repairs of the Museum Building		836.32	
Lectures	$990.56		
Less receipts from sale of Tickets	394.50		
		596.06	
Binding Expenses		1,371.24	
Salaries and wages		6,688.25	
General Expenses		1,464.47	$13,969.08
Excess of Expenditures over Receipts			$1,626.11

The above is exclusive of the incomes of the Bulfinch Street Estate Fund ($1786.60), the Walker Prize Fund, and one half of the Walker Fund, which are specially appropriated, and are not received by the Treasurer.

The following is a statement of the Property of the Society, exclusive of the' Cabinet and Library.

Museum Building.		
Cost of Building and Furniture, per last Report	$136,725.14	
Expended during the year	460.52	
		$137,185.66
Walker Fund.		
Notes secured by mortgage		41,105.00
Walker Prize Fund.		
19 Shares Atlas National Bank	$2,204.00	
26 " Tremont "	3,133.00	
6 " Globe "	771.38	
7 " Philadelphia, Wilmington & Balt. R.R. Co.	366.00	
14 " Vermont & Canada R.R. Co.	1,429.25	
Cash	7.00	
		7,910.63
Bulfinch St. Estate Fund.		
Note secured by mortgage	$15,000.00	
84 Shares Tremont National Bank	10,122.00	
2 " Globe " "	257.12	
16 " Vermont & Canada R.R. Co.	1,611.79	
Cash	60.14	
		27,051.05
Courtis Fund.		
50 Shares Globe National Bank	$6,250.00	
35 Shares Philadelphia, Wilmington & Balt. R.R. Co.	1,827.50	
$400 U. S. 5-20 Bonds	425.00	
		8,502.50
S. P. Pratt Fund.		
27 Shares Philadelphia, Wilmington & Balt. R.R. Co.	$1,407.63	
50 " Norwich & Worcester R.R. Co.	5,212.75	
10 " Webster National Bank	1,072.75	
6 " Boston " "	657.25	
Cash	121.94	
		8,472.32
H. F. Wolcott Fund.		
$6,000 Chicago and N. Western R.R. Co. 10's Bonds		6,058.27
General Fund.		
17 Shares Bates Manufacturing Co.	$1,700.00	
35 " Everett Mills	3,500.00	
30 " Hamilton Woolen Manuf. Co.	7,500.00	
80 " Washington Mills	8,000.00	
12 " Cocheco Manuf. Co.	7,200.00	
2 " Lowell Manuf. Co.	1,800.00	
4 " Laconia Manuf. Co.	4,000.00	
3 " Pepperell Manuf. Co.	3,000.00	
11 " Neptune Ins. Co.	1,760.00	
18 " Boston Ins. Co.	2,160.00	
114 " Vermont and Canada R.R. Co.	11,400.00	
95 " Michigan Central R.R. Co.	10,963.00	
50 " Ogdensb'g & Lake Champl'n R.R. Pref. Stk.	5,162.75	
38 " Philadelphia, Wilmington & Balt. R.R. Co.	1,976.25	
$6,000 Albany City Bonds	5,581.78	
20 Shares National Bank of Redemption	2,465.25	
85 " Pennsylvania Central R.R. Co.	5,071.50	
$4000 Bonds Summit Branch R.R. Co., 1870.	3,640.00	
		86,880.53
Miscellaneous.		
Unsettled Accounts and Cash	$1,151.90	
Less outstanding bills	234.00	917.90
Total value of Property April 30, 1870		$324,083.86
" " " 30, 1869		327,411.86
Diminution of value the past year		$3,328.00

In making up this statement, I have reduced the valuation of the manufacturing stocks bequeathed to this Society by Dr. W. J. Walker, our great Benefactor, by the sum of $4,790.00.

All which is respectfully submitted,

E. Pickering,

Treasurer Boston Society of Natural History.

Boston, April 30, 1870.

Mr. T. T. Bouvé, on behalf of the Trustees, presented the following report on the Trust Funds of the Society for the past year: —

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE COURTIS FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. CR.

Date	Dr.			Date	Cr.	
1869. July 6.	To Cash received of Philadelphia and Wilmington R.R. Div. on 35 Shares		$70.00	1870. April 30.	By Cash paid to Treasurer	$666.91
Sept. 24.	" received of Globe Bank Dividend on Stock		250.00			
1870. Jan. 3.	" received of Philadelphia and Wilmington R.R. Div. on 35 Shares		70.00			
Mar. 22.	" received of Globe Bank Dividend on Stock		250.00			
"	" rec. Int. on U. S. Bonds	$24.00				
	and Premium on Gold	2.91	26.91			
			$666.91			$666.91

Errors Excepted. Boston, April 30, 1870.

THOS. T. BOUVÉ, TRUSTEE.

Examined and found correct.

R. C. GREENLEAF,
JOHN CUMMINGS.

Boston, April 30, 1870. The property of this Fund consists on date, of

50 Shares Globe Bank at 125	$6,250.00
35 Shares Phil. & Wil. R.R. at 52	1,827.50
U. S. Bonds $400 (Transferred from General Fund)	425.00
	$8,502.50

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account Cr. with the Walker Prize and Special Expense Fund of the Boston Society of Natural History.

Date	Dr.	Amount	Date	Cr.	Amount
1869. April 30.	To Cash Balance of account	$797.49	1869. June 1.	By Cash paid for 6 Shares Globe Bank	$771.38
Oct. 1.	" received of Trustees Walker Fund one half amount received by them on date	375.00	Oct. 1.	" " " 7 " Philadelphia and Wilmington R.R. Stock	366.00
	" received Dividend Globe Bank	30.00	Oct. 1.	" " " 5 Shares Vermont and Canada R.R. Stock	506.50
	" " " Tremont Bank	130.00	1870. Mar. 9.	" " " 4 Shares Vermont and Canada R.R. Stock	408.75
	" " " Atlas Bank	95.00	April 18.	" " " 5 Shares Vermont and Canada R.R. Stock	514.00
Oct. 7.	" " of Trustees one half amount of Interest on Mortgage Note	241.57		" Balance	7.00
Dec.	" received Dividend on Vermont and Canada R. R. Co.	19.00			
1870. Jan. 4.	" received Dividend on Philadelphia and Wilmington R. R. Co.	14.00			
Mar. 8.	" received of Trustees Walker Fund one half amount received by them on date	375.00			
April.	" received Dividend Globe Bank	30.00			
"	" " " Tremont Bank	130.00			
"	" " " Atlas Bank	95.00			
April 5.	" " of Trustees Walker Fund one half amount received by them on date	241.57			
		$2,573.63			$2,573.63

Examined and found correct,
R. C. GREENLEAF,
JOHN CUMMINGS.

Errors Excepted. Boston, April 30, 1870.
THOS. T. BOUVÉ, Trustee.

Boston, April 30, 1870. The Property of this Fund on date consists of

19 Shares Atlas Bank at 116	$2,204.00
26 Shares Tremont Bank at 120½	3,133.00
6 Shares Globe Bank	771.38
7 Shares Philadelphia and Wilmington R. R.	366.00
14 Shares Vermont and Canada R. R.	1,429.25
Cash on hand	7.00
	$7,910.63

Dr. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE INCOME FROM THE WALKER FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. Cr.

1869. Oct. 1.	To Cash received six months' Interest on Mortgage Note	$750.00	1869. Oct. 1.	By Cash paid to Treasurer, one half of amount received on date . . .	$375.00
			"	" paid to Trustees of Prize Fund one half amount received on date .	375.00
Oct. 7.	" " six months' Interest on Mortgage Note	483.15	Oct. 7.	" paid to Treasurer, one half amount received on date . . .	241.58
			"	" paid to Trustees of Prize Fund one half amount received on date .	241.57
1870. March 8.	" " six months' Interest on Mortgage Note	750.00	1870. March 8.	" paid to Trustees of Prize Fund one half amount received on date .	375.00
			"	" paid to Treasurer one half amount received on date . . .	375.00
April 5.	" " six months' Interest on Mortgage Note	483.15	April 5.	" paid to Treasurer one half amount received on date . . .	241.58
			"	" paid to Trustees of Prize Fund one half amount received on date .	241.57
		$2,466.30			$2,466.30

Errors Excepted. Boston, April 30, 1870.

THOS. T. BOUVÉ, Trustee.

Examined and fonnd correct,

R. C. GREENLEAF,
JOHN CUMMINGS.

Boston, April 30, 1870. The Property of this Fund consists on date of Mortgage Notes amounting to $41,105.00

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT CR.
WITH THE BULFINCH STREET ESTATE FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY.

Date	Dr.	Amount	Date	Cr.	Amount
1869. April 30.	To Cash, balance on hand	$142.45	1869. June 1.	By Cash paid for 2 Shares Globe Bank	$257.12
May 27.	" received six months' Interest on Mortgage Note	450.00	Oct. 14.	" " 7 Shares Vermont and Canada R.R. Co's Stock	709.04
Oct. 1.	" received Dividend on Tremont Bank Stock, 84 Shares	420.00	Dec.	" " 5 Shares Vermont and Canada R.R. Co's Stock	491.50
"	" received Dividend on Globe Bank Stock, 2 Shares	10.00	1870. Apr. 19.	" " 4 Shares Vermont and Canada R.R. Co's Stock	411.25
Dec.	" received six months' Interest on Note	450.00		" Balance	60.14
"	" received Dividend on Vermont and Canada R. R. Stock	26.60			
1870. April 1.	" received Dividend on Globe Bank Stock, 2 Shares	10.00			
"	" received Dividend on Tremont Bank Stock, 84 Shares	420.00			
		$1,929.05			$1,929.05

Errors Excepted. Boston, April 30, 1870.

THOS. T. BOUVÉ, TRUSTEE.

Examined and found correct,

R. C. GREENLEAF,
JOHN CUMMINGS.

Boston, April 30, 1870. The Property of this Fund consists of

Mortgage Note of J. B. Smith	$15,000.00
84 Shares Tremont Bank Stock, at 120½	10,122.00
2 Shares Globe Bank Stock	257.12
16 Shares Vermont and Canada R. R. Co.	1,611.79
Cash on hand	60.14
	$27,051.05

DR. THOS. T. BOUVÉ, CHAS. J. SPRAGUE AND EDWARD PICKERING, TRUSTEES, IN ACCOUNT WITH THE WOLCOTT FUND OF THE BOSTON SOCIETY OF NATURAL HISTORY. CR.

1869. Oct. 20.	To Cash received Dividend on Chicago and N. Western R.R Bonds	$285.00	1870. Apr. 30.	By Cash paid to the Treasurer, and expended by him for Books .	$570.00
1870. Apr. 30.	" " Dividend on Chicago and N. Western R.R. Bonds	285.00			
		$570.00			$570.00

Errors Excepted. Boston, April 30, 1870.

THOS. T. BOUVÉ, TRUSTEE.

Examined and found correct,

R. C. GREENLEAF,
JOHN CUMMINGS.

Boston, April 30, 1870.	The Property of this Fund on date consists of Chicago and North Western Railroad Bonds . . . . Which represent $6,058.27; the increase being due to non-expenditure of the whole income for Books.	$6,000.00

Dr. Thos. T. Bouvé, Chas. J. Sprague and Edward Pickering, Trustees, in account with the Pratt Fund of the Boston Society of Natural History. Cr.

Date	Dr.	Amount	Date	Cr.	Amount
1869. Apr. 30.	To Cash balance on hand on date	$121.94	1870. Apr. 30.	By Cash paid to the Treasurer during year and expended by him for labor on Collection	$446.00
July 6.	To Cash rec. dividends of Phil. and Wilmington R.R.	54.00	"	By Cash balance on hand on date	121.94
Oct. 1.	" " " Boston National Bank	24.00			
"	" " " Webster Nat. Bank	40.00			
1870. Jan. 3.	" " " Phil. and Wil. R. R.	54.00			
Jan. 10.	" " " Norw'h and Wor. R.R.	250.00			
Mar. 28.	" " " Boston National Bank.	24.00			
		$567.94			$567.94

Errors Excepted. Boston, April 30,1870.

THOS. T. BOUVÉ, Trustee.

Examined and found correct,

R. C. GREENLEAF,
JOHN CUMMINGS.

Boston, April 30, 1870. The Property of this Fund on date consists of

50 shares Norwich and Worcester Railroad at $104	$5212.75
6 shares Boston National Bank at $109½	657.25
10 shares Webster Bank at $107	1072.75
27 shares Philadelphia and Wilmington Railroad at 51⅞	1407.63
Cash on hand	121.94
	$8472.32

The apparent diminution of this fund from the stated amount of the bequest, $10.000, is owing to a sale of the New York Cent. Railroad Bonds received for that amount, the bonds being of a class which only brought the above sum.

Dr. Baldamus of Halle, Mr. Wm. P. Turnbull of Philadelphia, and Col. R. L. Playfair, British Consul at Algiers, were elected corresponding members.

Mr. F. W. Putnam thought that something more than a simple vote of thanks was due to the retiring Custodian, and therefore moved that the rules be suspended and Mr. Scudder made a Life Member of the Society. The motion was seconded by Mr. T. T. Bouvé and carried by acclamation.

The Prize Committee reported, through Dr. J. B. S. Jackson, that only one essay had been offered in competition for this year's prize and it was not deemed worthy of it.

They announced as the subject of the prize for 1872: "The Darwinian question; its bearing on the development of animal life."

The Nominating Committee reported, through Mr. R. C. Greenleaf, a balloting list of officers for the ensuing year.

They stated that letters had been received from the President, Dr. Jeffries Wyman, now absent in Europe, declining to be a candidate for reëlection; they hoped, however, that he might be induced to continue in the office, and therefore requested further time for consideration. They also stated that the Council had only that afternoon rescinded their action in regard to the Microscopical Department, and had divided the Departments of Mammals and Comparative Anatomy, and the Committee had not yet had time to select suitable candidates for them.

The following gentlemen were then elected officers for 1870–71:—

PRESIDENT,

VICE-PRESIDENTS,

CHARLES T. JACKSON, M.D., THOMAS T. BOUVÉ.

CORRESPONDING SECRETARY,

SAMUEL L. ABBOT, M.D.

RECORDING SECRETARY,

J A. SWAN.

TREASURER,

EDWARD PICKERING.

LIBRARIAN,

J. A. SWAN.

CUSTODIAN,

ALPHEUS HYATT.

COMMITTEES ON DEPARTMENTS.

Birds; Nests and Eggs.

Thomas M. Brewer, M.D.,
Samuel Cabot, M.D.,
J. A. Allen.

Fishes and Reptiles.

D. H. Storer, M.D.,
F. W. Putnam,
N. E. Atwood.

Insects.

F. G. Sanborn,
A. S. Packard, Jr., M.D.,
Edward Burgess.

Crustaceans and Radiates.

A. S. Packard, Jr., M.D.,
A. E. Verrill,
Alexander Agassiz.

Mollusks.

Edward S. Morse,
John Cummings,
Levi L. Thaxter.

Palæontology.

W. H. Niles,
N. S. Shaler,
T. T. Bouvé.

Botany.

Wm. T. Brigham,
Charles J. Sprague,
J. A. Lowell.

Minerals and Geology.

Thomas T. Bouvé,
Charles T. Jackson, M.D.,
William T. Brigham.

The Nominating Committee were instructed to bring in additional nominations for the vacant departments.

The Secretary then presented the following papers by Dr. A. S. Packard, Jr., M. D.:—

Catalogue of the Phalænidæ of California.

By A. S. Packard, Jr., M.D.

The following notes are taken from a monograph of the North American species of this lepidopterous family in course of preparation. The new species here described were kindly communicated by Messrs. Henry Edwards and J. Behrens of San Francisco, Cal. A few species, and those among the most interesting, are from Nevada.

The occurrence of the genus Heterolocha, not before found in North America; of a species of Rumia more closely allied to the European *R. cratægata* than *R. sulphurea* Pack. MS. found in Maine, and of a species of Chesias, indicate that in this family as in the Bombycidae, the Nocturnal Lepidoptera repeat on the Pacific slope of our continent certain features peculiar to the European, or western shores of the eastern hemisphere, as has been observed in the Diurnal Lepidoptera, the Neuroptera, and the Crustacea and Mollusca of California.

Unless otherwise stated the specimens were collected in California.

The types of the new species are contained in the Museum of the Peabody Academy of Science, Salem.

Chœrodes nubilata n. sp. ♀.

Closely allied in form and structure to *C. transversata*; the fore wings slightly more falcate, but the hind wings a little less caudate. Fawn colored, like dark individuals of *C. transversata*. Head, palpi and body concolorous with the base and outer edge of the wing, being specked with black scales and short strigæ. On the basal third of wing, is a very distinct dark, zigzag, broad, diffuse, blackish band, not reaching the costa, being most distinct on the hind edge; the outer line is brown, and is curved on the submedian cell, thence going straight to near the apex where it is reflected at an acute angle on to the costa; the angle, however, is less acute than in *C. transversata*, and the reflected portion half as long. Just outside of this line are five diffuse blackish patches, one on the inner edge near the angle, the other resting on the apex, and forming a diffuse oblique line which passes within the angle of the outer line. The median part of the wing between the two lines is clear tawny fawn color, with obscure large transverse strigæ not present elsewhere on the wing. The discal dot is large and distinct, smaller on hind wings. Hind wings with thick diffuse strigæ, less fine than on fore wings, and a single outer

slightly sinuate brown line, on the inner side of which the wing is clearer than elsewhere. Beneath, the wings are closely dotted with dark scales, with the outer lines reproduced, though most distinct on the hind wings.

♂. Length of fore wing, .85 ; body, .65 inch. Behrens.

Chœrodes ægrotata (Guen.) ♂, ♀.

The wings are less falcate than in *C. transversata* and *transducens*, the hind wings are like *C. transversata*, but with a slight tooth between the apex and central large tooth, while the wings are without the usual band on their outer third. Head, palpi, and antennæ the same. Body and wings of a uniform pale light fawn color; wings almost white beneath. Head with thick hairs on vertex, the scales being longer than usual; just below the antennæ a dark brown band; below a little paler than the vertex. Palpi tipped with brown. Antennæ concolorous with the rest cf the body. Wings densely speckled with brown; an inner curved, very slightly dusky line with five or six black dots, and a similar line going from just beyond the middle of the hinder edge, following a sinuous course to the costa near the apex, with a black dot on each venule. A few minute black dots on base of fringe, which is concolorous with the rest of wing. A slight discal dot on both wings, that on fore wing small but diffuse, that on hind wing a minute black dot; hind wings same as fore wings, the speckles are arranged in a faint band, straight, crossing the middle of the wing. An outer curved row of black dots parallel to the outer edge. Beneath, dull white; costa and antennæ, half of fore wings, together with the costa and outer half of hind wings sprinkled with black scales, and a row of dots parallel to outer edge of wing near edge; discal dots as above, but larger and much more distinct. Fore legs dusky in front, tarsi of hind and middle legs dusky, otherwise white.

Length of fore wing, .83 ; body, .65 inch.

This common species varies in the tint of the wings, and the outer line of dots varies in distinctness and degree of sinuosity. In one specimen the outer band on the fore wing divides into two, the inner, opposite the discal dot, being a broad wavy band situated halfway between the dot and the outer band.

Several specimens received from Mr. Behrens show that this species varies considerably in the degree of distinctness of the dusky cloud on the inside of the outer row of dots, the inner edge often being straight and crossing the middle of the wing, while both pairs

of wings, in some examples, are much darker than in others. The lines and dusky borders are more conspicuous, the inner and outer lines farther apart, and the inner line more curved in the ♂. The wings of this sex are paler, the speckles being less numerous. The wings of the ♀ also vary.

One ♂ from Mr. Behrens differs in being of a deeper fawn color, with the two lines on the fore wings and single outer line on the hind wings, forming very distinct dentate black lines, and the two on the fore wings much nearer together than usual; discal dot obscure, and inner line on the fore wings less curved than in other ♂ specimens. It is a little smaller in size. Beneath the same, but the lines more distinct. Wrongly referred to the genus Tetracis by Guenée.

Heterolocha Edwardsata n. sp. ♂, ♀.

This very interesting species evidently is an aberrant form of this genus of Lederer's. The head agrees with Epione; the form of the wings is a mean between Rumia and Epione, and the venation is that of Rumia, quite different from that of Epione. The wings seem to be more falcate and the outer edge more oblique than in the other species described, and in our species the usual line on the hind wings is wanting, approaching Rumia in that respect. The ♂ antennæ are very broadly pectinated, the branches suddenly shortening on the outer quarter, the tip being filiform. The ♀ antennæ are moderately pectinated, the tip being filiform. The hind wings are not so produced and rounded towards the apex as in Epione, though more so than in Rumia; mesial tooth slightly marked. Body and abdomen much as in Rumia.

♂. Head yellow, with reddish pink orbits and palpi. Body yellow, and wings of the same color, the hind wings being unmarked, a little paler; the fore wings with a discal dot and a single oblique outer scalloped line going obliquely from the outer quarter of the inner edge to the costa just before the apex; the fringe is yellow, slightly stained with dark brown below the apex, the under side of the wings is sparsely scattered with minute brown scales; beneath are two subapical lines forming a V, the fringe is brown, and the wings more speckled than above; discal dots larger than above.

The ♀ differs in its much larger size and in the inner line being present, forming a broad diffuse brown band, interrupted by the veins and angulated in the median space; the outer edge of the wing reddish brown beyond the oblique scalloped line, the wing becoming more yellowish on the edge, and the fringe dark brown below the apex.

The scalloped line reappears distinctly beneath; discal dot large; several other brown flecks are scattered over the middle of the wing.

Length of body, .50; fore wing, ♂ .70, ♀ .75 inch.

Dedicated to Mr. Henry Edwards, who has been the first to discover the genus in North America.

Ellopia Californiaria n. sp. ♀.

Connects by its large palpi projecting beyond the front, and by its full front *E. fascaria* Pack. MS. with the other species, *E. fervidaria*, etc. Pale ash with numerous brown scales and strigæ, thickened on hind wing. Middle of wing dark brown, contrasting remarkably with the rest of the wing; inner side of the band moderately oblique, the edge being straight, not sinuate. On the outer side the band is deeply hollowed out, the course being very regular, and towards the costa the band retreats towards the middle of the wing so that the band is just as wide on the costa as at the lower portion opposite the excavation. Beyond, the wing is colored as near the base. Hind wings more densely speckled than fore wings, with a short, straight, brown line starting from inner edge near the inner angle, and fading away before reaching the middle of the wing; otherwise the wing is unmarked. Beneath, no lines, but the wing is ochreous, with a distinct yellowish tinge, and is densely speckled with brown, uniformly on both wings.

Length of body, .50; fore wing, .72 inch. Behrens.

Ellopia ? placeraria Guen. Hist. Nat. Lép. Uranides et Phalénites, i, 132.

Tetracis ægrotata Guen. i, 141.

Tetracis truxaliata Guen. i, 142, pl. 20, fig. 9. Two males, Edwards; a female, Behrens.

This species is intermediate between the section of the genus to which *T. aspilates* and *T. crocallata* belong, and the third section of which *T. trianguliferata* is the type, as shown in the great length of the palpi, and the acutely angulated wings.

Tetracis trianguliferata n. sp. ♂.

This remarkable species belongs to a distinct section of the genus from any described, as the ♂ antennæ are pectinated, the palpi are remarkably long, and the venation is different. Though at first inclined to separate it as a new genus I shall retain it in the present one, assuming that this and *T. truxaliata* are the more aberrant forms of the genus; the palpi do not vary so much in Endropia, though

the wings and legs do. *L. truxaliata*, however, is more nearly allied to our eastern species than the present one.

It differs from *L. aspilates* and *crocallata* in the head being a little smaller, and the front slightly narrower, while the antennæ are well pectinated, the pectinations being slender and rather long, as long as in some species of Caberodes. The palpi are remarkably long, erect, rising far above the front, and usually pointed; the third point is more indistinct than is usual in this genus or in Endropia or Caberodes. The hind femur is slender, not swollen as in the other species; the costa is much wider, so that the subcostal venules are shorter and thrown off at a much greater angle; the lozenge shaped subcostal cell is one half smaller than in the two other species, and there are other slight differences, the venation of *T. crocallata* and *aspilates* being almost identical. The wings are a little narrower, much more angulated, and the markings are different. This divergence is paralleled by that observed in the species of Endropia, though *E. serrata* is serrated and the wings long and narrow, while in *E. pilosaria* Pack. MS., the wings are short and broad, and the edges entire; this is the most aberrant species of the genus known to us. In Caberodes there is much the same divergence from the generic type. *C. florida* differs from *C. majoraria*, the type of the genus, in having narrow angulated and falcate wings, and antennæ with pectinations half as long as in the latter species.

It is bright ochreous yellow, both wings dotted over with brown specks. Orbits and tips of palpi speckled with light brown. Three large brown spots edged with dark brown on the costa, the basal one next the thorax not extending below the subcostal vein, and nearly twice as long as broad, the second just within the middle of the wing, equilaterally triangular, the apex blunt and resting on the median vein; the third is nearer the apex than the second spot, and is equilaterally triangular, with the apex acute and resting on the independent venule. Between these two last spots are three small costal spots. A minute discal dot. Fringe concolorous with the rest of the wing. Hind wings with a large tooth; a large tooth in middle of fore wing. Hind wings slightly paler on inner half, no markings. Beneath, the large triangular spots are faintly reproduced and the brown speckles are long and larger than above. The fringe is yellow, with a brown line at base.

Length of fore wing, .76 inch. Edwards.

Azelina Hübneraria Guen. i, 159.

Specimens from Messrs. Edwards and Behrens do not differ from examples from Massachusetts and Illinois. In the female, however, the outer line is less sinuate, and the inner line on the fore wings is nearly obsolete.

Azelina Behrensaria n. sp. ♂.

Closely allied structurally with *A. Hübneraria.* Ash granite gray. Head and body pale granite gray, abdomen darker; a line on hinder edge of each segment; thorax very hairy, with a prominent median crest. A broad, fawn colored brown band in middle of wing, limited by the inner and outer line which are dark black brown and very distinct ; inner line curved just below the costa, and slightly sinuate below the median vein; outer line sinuate as in *Hübneraria*, having a deep curve inwards in the middle of the wing, and another near the inner edge, and oblique on the costa. Beyond this line the wing is ash gray as at base, with a large oval diffuse fawn-brown spot extending from near the internal angle to the middle of the wing. Edge of the wing a little darker than next to the outer line; a dark line at base of fringe. In the hind wings, which are pale ash gray, the single outer line is nearer the outer edge than in *A. Hübneraria*, and is a little more sinuate. Base of fringe lined with black, and four black diffuse intervenous spots very unlike the large distinct ones of *A. Hübneraria.* On fore wings a large curvilinear white discal dot, lined within with black scales. Beneath, uniformly pale ash ; discal dot more diffuse than above, with a black dot within.

Length of fore wing, .73 ; body, .65 inch. Behrens.

At once known by the broad fawn-brown central band on fore wings, contrasting with the pale granite ash gray of the rest of the wings and body, and by the clear, large discal dot. Antennæ a little slenderer than in *Hübneraria.*

Metanema cervinaria n. sp. ♂.

Differs structurally from the other species described by Guenée, in the antennæ not being pectinated, but finely ciliated beneath, while the palpi are rather large and stout, passing a little beyond the front. The body and wings are of an uniform fawn color, the scales being thick and close. The basal line is angulated on the median vein, extending thence straight to the costa, and below the median vein its course to the inner edge is oblique and slightly sinuous. The outer line pale testaceous; like the inner it is a little more distinct, and is

slightly sinuous ; it is situated half way from the inner line to outer edge. Apex very acute, median angle large, as is that on the hind wing. A minute black discal dot on both wings. On hind wings the single straight pale line is a little broader than on fore wings. Fringe short, testaceous, a little reddish at base, especially towards the angles. Abdomen a little paler than thorax. Beneath, the wing is pale ochreous with dense black strigæ, often confluent; both wings are shaded with a slight ashen tinge on the outer edge ; on fore wings the strigæ unite in diffuse patches, forming an irregular broad band on the outer third of the wing; fringe as above.

Length of fore wing, .87 ; body, .72 inch.

W. Springs, Cal. Behrens.

This fine species may be recognized by its large size, uniform fawn color, the simple antennæ, and the two testaceous lines on the fore wings.

Metanema forficaria Guen. i, 172.

Boarmia clivinaria Guen. i, 245.

Boarmia Californiaria n. sp. ♂. ♀.

This fine species belongs to Guenée's first group, and is allied to the European *B. repandaria.* The male is ash colored, with numerous black scales, and is clouded more or less with dull ochreous patches. Antennæ well pectinated. The usual three transverse black diffuse lines present ; the basal one is much curved, a little wavy, and ends on the costa at the basal third. On the costa it is straight, just below pointed subacutely outwards, and curved outwards a little just below the median vein, thence going obliquely to the basal fourth of the inner edge of the wing. From the inner edge a supplementary diffuse brown line accompanies it on the inner edge as far as the median vein. The middle line is sinuate, curved just below the costa, and towards the costa becomes much broader. The outer line is more clear, runs near the middle line, and consists of three wavy, slightly marked scallops, one point resting on the lower submedian venule, the other on the third médian venule. A submarginal zigzag white line ; a scalloped black distinct line on the edge of the wing. Fringe ash brown ; three diffuse ochreous brown patches on the inner edge of the wing. Hind wing marked like the fore wing ; the basal line diffuse, blackish, straight; a rather obscure discal dot (none visible on fore wings). An outer slightly scalloped line, like the basal one, not reaching the costa. It goes straight from the inner edge to the middle of the discal area, where it makes a slight bend

inwards towards the costa; it is bordered without by a broad diffuse brown line. Beyond is a blackish submarginal line, a little angulated in the discal space; edge of wing deeply scalloped, the points subacute. The female is paler ash, less ochreous and the hind wing more deeply scalloped.

Beneath pale ash with blackish scales and minute strigæ; discal dot on both pairs of wings large, rounded and distinct, the outer line common to both wings faintly reproduced.

Length of body, .65; fore wing, .80 – .82 inch. Behrens.

Tephrosia Californiaria n. sp. ♂.

This species belongs to the same group as *T. canadaria*, but the wings, fore and hind, are shorter and broader; otherwise the head, antennæ, and form of the body are the same. Reddish ash, fore wings a little deeper reddish; with three diffuse dusky brown lines, the basal, on the inner fourth of the wing, curved, angulated on the submedian vein, and sinuate just below the median vein; the middle line is situated just beyond the discal dot, and is slightly oblique, sinuate, and connected with a large dusky cloud enclosing the discal dot, and sending a diffuse line to the costa and internal margin of the wing. Half way between the discal dot and the outer edge of the wing is a broad scalloped line deepening in tint towards the points of the scallops; a larger scallop than the others rests on the inner edge of wing; just below the middle of the wing are two large twin scallops and two larger than the others near the apex, there being eight scallops in all. A row of black dots along the edges of both wings; fringe concolorous with both wings. Discal dot on fore wings minute, black, surrounded by a white round spot. On the hind wing three faint diffuse lines start from the inner edge, disappearing in the middle of the wing. Beneath clear pale ash; discal dots distinct, costal and outer edge speckled with black scales. Varies in size and distinctness of median cloud on fore wings, and of the short lines on hind wings. 3 ♂.

Length of body, .50; fore wing, .57–.64 inch. Behrens.

Tephrosia ferruginosaria n. sp. ♀.

This cannot be the female of the preceding species, though belonging to the same section and closely allied to it structurally. It is ferruginous ash on fore wings, thorax and head. Base of wing (inner quarter) ash, with thick dusky scales, concolorous with the outer edge of the wing. In the middle third of the wing is a broad dusky band,

a little wider on the costa than on the inner edge, and opposite the discal dot produced outwards into an obtuse point. Discal dot black, larger than in *T. Californiaria*, and surrounded by a white ring. Half way between this and the outer edge of the wing is a slightly oblique scalloped line (eight distinct scallops), the points acuter and much smaller than in *T. Californiaria*; a few white scales about the points, within dark brown; a broad, rather clear, pale rust red band between the scalloped line and the mesial broad dusky band.

Along edge of fore wings a row of minute black dots, much smaller than in *T. Californiaria*, and obsolete on hind wings. Hind wings considerably paler than fore wings, freckled with dusky scales, arranged in three diffuse indistinct bands, one enclosing the discal dot; the basal one rather near the mesial one. Beneath uniform pale ash freckled with minute black scales. Both wings alike, discal dots distinct on both wings. Hind wing not so clear of scales as in *T. Californiaria*, and no row of marginal black dots, as in that species.

Length of body, .45; fore wing, .58 inch.

Behrens.

This is more rust red than any species known to me. We have no reddish tinged specimens from the Eastern States.

Nemoria? faseolaria Guen. i, 351.

Synchlora liquoraria Guen. i, 375.

Acidalia sideraria Guen. i, 451.

Acidalia 5-linearia n. sp. ♂. ♀.

White speckled with minutely brown scales; head white on the vertex; front black, palpi white, edged above with black scales. Antennæ of ♂ with long coarse hairs. Thorax and body white; wings white, finely powdered with brown scales, fore wings with five yellowish brown lines, the basal one on the inner fourth of the wing much curved on the median vein; the second is the broadest and most distinct, going obliquely from the outer third of the costa to the middle of the inner edge. Half way between this line and the outer edge is a wavy slender line, parallel to the edge; and between it and the outer edge are two faint diffuse irregular lines. The outer four of these lines are continued on the hind wing, the inner and shortest one being straight and distinct, the others more or less waved. Discal dot minute, black, much larger and more distinct on hind wing. The outer edge of fore wing is narrowly edged with black between the venules, and there are small black dots on the fringe, opposite the ends of the venules; fringe white. Costa testaceous above and on

the under side. Beneath, the discal dots more distinct. Beyond the discal dots on fore wings are two black lines, the outer wavy; and on the hind wings one line only is present, being wavy and situated nearer the outer edge than its fellow on the upper side. Wings paler than above.

Length of body, .38–.48 ; fore wing, .54–.64 inch. Edwards, Behrens. Allied to our eastern *A. enucleata* Guen.

Acidalia granitaria n. sp. ♂.

A smaller species than usual, of a granite gray, slightly tinged with brown. Body dusky, with conspicuous white scales; tarsi white; abdomen ringed with white; tipped with white. Antennæ with curved bristles. Palpi dark. Head rather dark. Inner half of fore wings uniformly black pepper-colored, enclosing a black, round, rather prominent discal dot, just beyond which is an oblique, slightly waved, pale whitish band, bordered externally with a black line, most prominent on the inner edge of the wing. Beyond this line is a narrow white line, broadest on the inner edge of the wing. Beyond is a brownish, broad, diffuse band, with a row of longitudinal white spots just beyond, with brownish scales between the spots. On the edge, at the base of the fringe, is a row of white spots, each spot with a dark spot on the outer edge consisting of a few blackish scales. Fringe concolorous with the rest of the wing.

Hind wings marked the same as in the fore wings and colored the same. Just beyond the conspicuous discal dot is a brown line; beyond is a broader pale band, lined with black and with a narrow whitish line beyond. Then succeeds a diffuse brownish band, and the outer edge and fringe are marked in the same way.

The same markings are repeated on the under side of the wing. The discal dot is less distinct than above, beyond is a distinct sinuate blackish line on a whitish field, and still beyond is a brown line half as wide as on the upper side of the wing. The edge of the wing is whitish, with fine intervenular black spots, and the fringe is checkered with black opposite the ends of the venules.

Length of body, .23; fore wing, .28 inch.

Differs from the other species here noticed by its diminutive size and granite gray color. Edwards.

Acidalia Californiaria n. sp. ♂, ♀.

Snuff brown, head and antennæ and thorax darker brown, antennæ with long dense cilia, curved at the ends. Abdomen paler than

thorax. Wings of a uniform snuff brown, speckled minutely with black, especially along the costa. No basal line on fore wing; a prominent dusky, diffuse, wavy extradiscal line, oblique, a little sinuate, parallel with the outer edge of the wing ; half way between this and the base of the fringe are two indistinct lines, the inner one most distinct and very wavy; a narrow dark line along the base of fringe, which last is clear snuff brown. A faint brown discal dot. The same lines are repeated on hind wings. Beneath scarcely paler than above, with the extradiscal line black and very distinct, finer than on the upper side; the two other lines very faint, the inner one however, in some specimens, quite distinct and very wavy. A marginal row of small black dots; the base of both wings is thickly speckled with black scales.

Length of body, .35–.40 ; fore wing, .40–.46 inch. Edwards.

A. Pacificaria n. sp. ♂, ♀.

Closely allied to the preceding, but differing in its smaller size, the more rounded apex of fore wings, and the less oblique outer border. The extradiscal line is blacker than in the other species, and much less oblique, with a bend inwards below the median vein; discal dot distinct, black. Near the outer edge is a pale, clear, irregular, scalloped line parallel to the outer edge, and diminishing in width towards the costa. A marginal row of distinct, minute, black dots, not present in the other species, and the wing is more dusky at base. Beneath, the two outer lines are nearly equally distinct, the outer one waved; hind wings much as in *A. Californiaria*.

Length of body, .34; fore wing, .35 inch. Edwards.

Acidalia rubromarginaria. ♂.

Brown, with a reddish tint. Body and base of both wings ferruginous dull brown; both wings dull reddish brown at base; on fore wings this tint extends to a little beyond the middle of the wing, its outer edge irregular, angulated in the middle and excavated below. It is crossed just before the middle of the wing by a slightly oblique, dark line, on which rests an irregular row of light brown scales; beyond the wing is a clear tawny brown, with a submarginal line curved and slightly waved, made up of black dots on the venules connected by a slight line; this line is parallel with the outer edge of the basal dark area. A marginal row of black dots; fringe deep brick red. Hind wings the same, but the dark portion at base only extends to first third of wing, and the broken wavy curved line of

dots is half way between this and the outer edge; fringe brick red, contrasting well with the clear tawny brown of outer two-thirds of wings. Beneath uniformly pale tawny brown, with a common diffuse waved middle line, doubled on the anterior half of hind wings, enclosing a narrow, oval, irregular spot, and a very faint, submarginal row of minute black dots; fringe red.

Length of body, .28; fore wing, .35. Edwards.

Macaria Californiaria n. sp. ♂, ♀.

Of the normal type of the genus. Allied to *M. 4–signata* Walk. Pale gray, speckled with a few brown scales. Fore wing with no transverse lines; three equidistant dark brown spots on the costa, the basal one smallest and narrowest, the middle one triangular, the outer one square and connected with an oblique row of blackish dots situated on the venules; that on the independent venule being the largest, and long ovate. Outside of this spot the wing is slightly clouded. A row of minute black dots at base of fringe, which is concolorous with the rest of the wing. The outer edge of wing is not excavated. The inner is not otherwise marked, except by frequent transverse strigæ. Hind wings with no bands; an obscure discal dot; uniformly strigated with dark brown. Beneath, the fore wing is strigated on the costa; veins distinct, testaceous. Hind wings strigated all over the under surface, the strigæ forming a slightly marked diffuse band near the outer edge. Behrens and Edwards.

Length of body, .35; fore wing, .57 inch.

Halia marcescaria Guen., ii, 92.

Guenée does not mention the oblique, brown, narrow line present on the fore wings of two ♂ ♂, nor the conspicuous double row of black dots along the abdomen. Edwards.

Halia cineraria n. sp. ♂, ♀.

Closely allied to *H. marcescaria*, but it is pale ash gray. ♂ Head and palpi ash, wings a little paler, while *H. marcescaria* has a testaceous hue. The fore wings are marked just like *H. marcescaria*, but they are narrower, and more excavated just below the apex. The strigæ are a little thicker on the costa than elsewhere. There are no indications of a basal line ; the outer line is situated nearer the middle of the wing than in the other species ; in the middle of the wing on the line is a black dot. Just beyond the line is a semi-translucent broad band. Discal dot as in other species. Beneath, the fore wing is pale ash, clear in the middle of the wing, with a speckled

costa and outer edge. Hind wings ash, mottled densely with brown scales ; discal dot distinct ; the wings darker on outer half beyond the single distinct brown line, with a dusky patch in the middle of the wings adjoining the line.

In the ♀ there is no line on fore wings. The hind wings are more angulated and dentated than in *H. marcescaria.*

Length of wing, .56 ; body, ♂ .45 inch. Edwards and Behrens.

Tephrina marmorata n. sp. ♀.

Closely allied in form and markings to *T. strigularia*, wrongly referred by Mr. C. S. Minot (these Proceedings, vol. XII.) to *Anisopteryx.* These two species belong to a distinct section of the genus, and at present I refer it to *Tephrina*, though I need more material to understand the genus better. The front of the head is much fuller, and the wings are more pointed, and the palpi are quite short, projecting but a little distance beyond the front. Body and wings pale ash with a testaceous hue ; a little deeper hue on the outer edge of both wings. The costal edge is marked with minute strigæ, most distinct on the extreme edge. A square whitish spot on the inner third of the costa, and an outer white distinct line broadest on the costa, disappearing before reaching the inner edge of the wing, bent on the first median venule. The fringe on both wings is white, checkered with large square brown spots ; no discal spot above or below on either wing Under side of fore wings bathed with yellow testaceous, veins distinct, testaceous; extreme costal edge dark, with white strigæ. Outer white line faintly reproduced, making with the white apex a rude V, enclosing a triangular mottled space ; remainder of the wing clear of scales. Under side of hind wings marbled beautifully, the ground color being white, with dark strigæ arranged in broken bands ; a central broad band angulated on the independent venule, with yellowish spots, especially on the venules, and the wing within is densely strigated, with the median area white, with a few brown strigæ ; from the inner angle arises a broad band which terminates on the first median venule. The outer edge of the wing is sprinkled with brown, especially on the apex and costa ; elsewhere it is pure white.

Probably from near the snow line, as our New England species was found by Mr. Sanborn on the summit of Mt. Washington.

Length of body, .50; fore wing, .75 inch. 2 ♀. Edwards. Nevada.

Tephrina haliata Guen., ii, 97.

Tephrina muscariata Guen., ii, 98.

Tephrina neptaria Guen., ii, 99.

Tephrina monicaria Guen., ii, 100.

Tephrina Lorquiniaria Guen., ii, 101.

Panagra flavo-fasciata n. sp. ♂.

Uniform granite gray, thickly speckled uniformly over the surface of the wing ; head and thorax concolorous. A slightly oblique narrow brown line, lined with yellow testaceous scales on inner quarter of wing, fading away on the costa. A circular black discal dot centered with white. An outer oblique, slightly sinuate yellow testaceous line, fainter on inner edge and costa of wing, lined externally with black scales ; a marginal row of triangular intervenous black dots. (Hind wings and abdomen wanting.) Beneath, uniformly speckled with gray and white scales; costa a little clearer; the diffuse discal spot indistinct. No bands or spots.

Veins testaceous and distinct beneath. I refer, with slight hesitation, a female specimen to this species from Mr. Behrens, which has the two bands on the fore wings a little farther apart, and the discal spot twice as large. These may be sexual differences. The hind wings have a diffuse discal spot, and a single diffuse slightly sinuous line beyond the middle of the wing, not reaching the costa. It does not reappear beneath, though the discal dot is large and distinct.

♂ Fore wing, .56 inch ; ♀ fore wing, .58 inch.

Edwards and Behrens.

Selidosema juturnaria Guen., ii, 147. ♂, ♀.

In a male received from Mr. Behrens, the wings are clearer, the outer line less distinct ; the dusky cloud near the internal angle of the wing is wanting, and the fringe is slightly checkered as in ♀ ; the hind wings are crossed on the under side by a well-marked curved band of large brown spots, and the under side is of a paler ashen gray than in the other specimens.

The ♀ differs from ♂ in the fore wings being clearer beyond the outer broad band, and in not having the large dark patch below the middle of the wing (present in the male), while the outer edge of the hind wings is clearer ; but it differs most in having the fringe checkered with white and dusky brown. Same size as ♂. A faint band on under side of hind wings not present in my single male specimen.

Selidosema Californiaria n. sp. ♀.

Pale ash, bathed on the fringe and beneath with reddish pink; the palpi are longer, and scales of front rougher than in *T. juturnaria*, otherwise it is structurally the same, though larger. Fore

wings crossed by a single curved, diffuse, dusky line, beginning on outer third of costa and curving and fading away before reaching the inner edge ; this slightly marked line being more regularly curved than in *S. juturnaria*. No discal dot seen above. Hind wings free from markings, fringe pinkish, and both wings beneath bathed with reddish pink. On fore wings a linear, small, discal dot; on hind wings a larger rounded discal dot. No band on hind wing, or any other markings or dusky scales, and on fore wings is a faint reproduction of the single outer line, disappearing before reaching the middle of the wing.

Length of fore wing, .86 inch. Behrens.

A larger species than *S. juturnaria*, and at once recognized by the red fringe and underside of wings.

Selidosema fæminaria Guen., ii, 149.

Fidonia avuncularia Guen., ii, 155. Nevada. Edwards.

Gorytodes uncanaria Guen., ii, 180. Edwards.

Larentia implicata Guen., ii, 284.

Eupithecia subapicata Guen., ii, 331.

Eupithecia rotundopuncta n. sp.

This species is of the more usual form, with long slender palpi reaching far beyond the head. General color pale reddish brown. Head, palpi, and body, like the wings. Fore wings covered with wavy brownish lines, dull whitish between ; discal dot large and round. Just beyond the discal dot there is a clearer band succeeded by a more dusky band widening on the costa, and lined externally at intervals with whitish. At base of fringe a row of intervenular, deep brown linear spots ; fringe concolorous with the rest of the wing. Hind wings clear in middle and on costa. A submarginal zigzag brown line, and marginal row of intervenular linear spots.

Beneath, the curvilinear dusky discal dot is distinct, wings clear, checkered on the costa with a submarginal dusky band; a marginal row of intervenular linear spots, and a dusky spot on the fringe opposite the end of each venule.

Length of fore wing, .40 inch. Edwards.

Eupithecia Nevadata n. sp.

In this pretty species the wings are much longer than usual, the outer edge being very oblique, the head very prominent, the prothorax being rather long, and the palpi rather short, very broad, passing beyond the front by a distance equal to that between the base of the antennæ, while in the species previously described the palpi

surpass the front by a distance equal to the length of the head itself. They are black, with a few white scales along the middle of the side; front edge of front blackish; front itself and vertex whitish; thorax whitish, with a few black scales. Fore wings pale gray. Base of costa black, terminating abruptly in a slightly curved black line ending in the middle of the median space; costa throughout dusky. Just before the middle of the wing is an oblique blackish band directed outwards and passing below the subcostal vein. Just above the discal dot is a square, black, costal patch, succeeded by two white, short lines. Half way between these and the apex are two twin white costal bands, with a broad black patch on each side. Beyond, is a squarish reddish brown patch, and the extreme apex is gray. The base of the wing below the costa is quite clear, with scattered dark scales, and a black linear spot on the end of the median vein at the origin of its branches; from this spot a linear reddish line extends to the discal dot, and below two dusky lines extend to the inner edge of wing, the inner being the wider. The discal dot is curvilinear, black, very distinct, edged with white externally. A few red scales are scattered over the space inside the discal dot.

Beyond the discal dot is a broad, clear, pale gray band, with a row of longitudinal black linear spots on the outer edge, becoming longer towards the costal edge of the wing; this broad space terminates on the subcostal vein; it is limited on the outer edge by a wavy light line. Beyond, is a row of reddish diffuse patches, forming a wide series of scallops. The outer edge of the wing is dusky gray; along the base of the fringe is a linear narrow black line interrupted by the ends of the venules. The long fringe is dirty white, with slightly darker scales. Hind wings clear on the costal and median areas, with a distinct, round, discal dot, the inner and submedian region covered with dark and light alternating crinkled lines, most marked on the venules.

Beneath, fore wings clear, with costa dusky at base; discal dot distinct, linear, extending to costa. Half way between it and a subapical black patch is a black line consisting of two dots. Beyond the discal dot both wings are lineated finely with black and gray, and the black line at base of fringe is very distinct.

Length of fore wing, .50 inch. Nevada. Edwards.

Hypsipetes Californiata n. sp.

Ash gray. Front of the head pale ash, palpi brown, pale on the edges. Eyes black; tegulæ pale ash speckled with black. Base of

fore wings pale gray; an oblique black line finely and acutely pointed on the median vein goes obliquely outwards; it is bordered within with reddish; this, with an irregular black line crossing the wing obliquely just before the discal dot and bordered within with red, forms a dark band crossing the wing and enclosing a median watery ash band. A dark irregular black line, forming a great angle on the last subcostal venule, where it is connected with an oblique black apical broken line. Between this and the intradiscal line is a clear light ash area, narrow on the inner edge of the wing, and three times as wide on the costa, and enclosing a linear long black discal dot. This extradiscal line is bordered externally with reddish brown, which is followed by a watery ash band indented on the venules. Beyond, the wing is dark ash, the fringe concolorous. The oblique black apical line consists of three or four longitudinal spots. Hind wings rather paler and of the same color beneath. Fore wings considerably darker beneath.

Length of fore wing, .70 inch. Behrens.

Hypsipetes 5-fasciata n. sp. ♀.

Of the ash gray color usual in the genus. Body and wings colored alike; two dusky spots on the prothorax, and two on each patagium. The fore wings are crossed by five dark smoke-colored bands; the basal one goes obliquely outwards from the costa to the inner edge, being angulated on the median vein. Beyond is a band twice as broad, dislocated in the median space; beyond and close to the preceding is a band half as wide and crossing the wing just before the middle. Just beyond it is a faint linear discal mark; the middle of the wing is clear. In the outer third of the wing is a narrow band, more or less scalloped like the others, and obtusely angulated outwards; a broad submarginal band deeply scalloped on the outer edge, the scallops being deeply pointed; the band increases in width towards the costa, the usual oblique apical streak partially conceals one of the scallops, being very well marked; outer edge of wing ash, not smoky. The veins and their branches are black on the bands. Hind wings light ash with no markings, and not sprinkled over with black scales, as in the preceding species; a very faint discal dot.

Beneath uniformly ash, the bands and discal spot very faintly reproduced, more distinct on the costa; the discal dot on the hind wing quite distinct.

Length of fore wing, .68 inch. Behrens.

Differs from *H. Californiata* in the quite different arrangement of

the bands, which are of a peculiar smoky color, not reddish, and appearing as if translucent. Rubbed specimens show the bands very distinctly.

Hypsipetes nubilofasciata n. sp. ♂, ♀.

This is a little smaller species than the preceding, but with a similar arrangement of the bands. It is a little lighter gray, with a very faint yellowish tinge in rubbed specimens. The fore wings are crossed by six bands ; the basal is directed obliquely outwards from the costa, and irregularly edged on each side with reddish scales, and is waved and angulated in the median space. This is succeeded by a broad smoky band, widest in the middle, just beyond which is a curved black band widening towards the costa, and wavy towards the inner edge of the wing, and bordered on both sides with reddish scales. Parallel and just beyond is a similar line, but a little narrower and less distinct, and bordered on each side with reddish scales which do not reach the costa. Just beyond this is a broad, sinuate, smoky band, irregular on the edges ; the outer edge of the wing is also smoky, forming a broad marginal smoky band, not present in the two preceding species. A blackish oblique apical streak. The hind wings are of the usual pale ash color, but are crossed beyond the middle by two dusky curved bands.

Beneath, the bands are very faintly reproduced on both wings, but their terminations on the costa of the fore wings form five large square dusky spots.

Length of body, .42 ; fore wing, .62 inch. Edwards and Behrens.

This species may at once be known by the outer edge of the fore wings being smoky, and the black band edged with reddish, except on the costa. It is a smaller species than the two others.

Coremia convallaria Guen., ii, 410. ♂, ♀. Edwards. Behrens.

Coremia defensaria Guen., ii, 411.

Coremia propugnata W-V. Does not differ from specimens from Iceland and New England.

Coremia plebeculata Guen., ii, 419.

Coremia Californiata n. sp. ♀.

This is closely allied to *C. ferrugata*, but is larger. The markings are arranged on the same plan. The ferruginous base of the fore wings is traversed by a pale line ; the outer edge of this reddish area is straight, instead of being curved as in *C. ferrugata*, slightly wrinkled, with an acute angle on the subcostal vein. This is suc-

ceeded by a clear pale ash band, traversed, however, by two linear reddish lines. The middle of the wing is crossed by a broad reddish band, black on the edges, and traversed by three dark lines very distinct on the costa, the lines being acutely angled outwards just below the subcostal vein ; the inner side of the band is a little curved, but not wrinkled, while in *C. ferrugata* it is not only plainly wrinkled but deeply and acutely indented on the subcostal vein ; the outer edge of the band and the markings on the outer edge of the wing are much as in *C. ferrugata*. The hind wings are less distinctly striped. The apical portion of the fore wings beneath is tinged with reddish. The hind wings are marked much as in *C. ferrugata*.

Head reddish brown, especially on the vertex. Palpi and occipital scales dull ashen, concolorous.

Length of body, .42; fore wing, .60 inch. Edwards.

Scotosia hæsitata Guen., ii, 444.

This agrees in the main with Guenée's description, which was probably drawn from a specimen less perfectly preserved than ours.

Behrens.

Scotosia Californiata n. sp.

This belongs to a different section of the genus from *S. hæsitata*, the apex being more pointed, the costal edge less rounded, and the palpi stouter and much shorter. It is dull ash, palpi blackish. Fore wings crossed by very fine numerous, wavy, parallel, black lines. Base of wing dull ash, crossed by a slender black line and edged with black, beyond which is a pale whitish line, succeeded by a broad dusky band; and beyond is a whitish band situated on the basal third of the wing. Beyond are four black wavy lines crossing the middle of the wing. Three submarginal black finer lines, and well-marked on the costa, below consisting of venular black dots. A marginal, zigzag, distinct, black line, fringe dull ash. Hind wings clear, much paler, without any bands except four short wavy lines near the inner angle. A black, zigzag, marginal line following the deep points of the well-scalloped edge of the wing. Beneath, the wing is clear and paler than above, but yet rather dusky, with black costal bands, and two obscure rows of testaceous venular spots. The zigzag marginal line is very distinct. Hind wings thickly dusted with black scales, with three obscure rows of venular dots on the outer half of the wing, and the marginal black line very distinct. The discal dots small but present on each wing. Legs black, ringed with white.

Length of fore wing, .70 inch. Edwards.

Cidaria mancipata Guen., ii, 468.

Cidaria nubilata n. sp. ♂.

Palpi long, acute, dark, with a few pale scales on the edges ; front dark in the middle, whitish on the sides. Body and wings ash ; base of fore wing dark, limited externally by a white, scalloped line, which is straight on the costa, with a scallop on the median space, another on the submedian, and a third on the inner edge. Another similar line, exactly parallel to this, crosses the wing nearly midway between it and the discal spot, which is small, black, linear, ovate. Beyond this spot the wing grows more and more dusky to the outer line, which is white, straight, and widest on the costa, wrinkled slightly below and in the middle of the wing, between the independent venule and the third median, forming a large, rounded, double toothed projection; from the third median to the inner edge the line is straight, consisting of three scallops, the central one being largest. A submarginal scalloped line, zigzag towards the costa, each scallop separate, and centered with a triangular or lunate spot. Just below the apex is a round, black spot, resting on the black line on the edge of the wing. Hind wings whitish, with a few short, dark and white lines on the inner edge; one sinuate, extending to the middle of the wing; the outer edge of the wing is dusky, with a black, marginal line, interrupted by white dots. Beneath, both wings much alike, ashy, with a slight ochreous tinge, blackish along the edge of the costa; discal dot distinct on the fore wings. A dusky outer line half way between the discal dot and outer edge of the wing, indented opposite the discal dot. A submarginal row of distinct, white spots, less distinct on the hind wings. A long pencil of black hairs arises from the base of the fore wings, and is partially concealed by the costa of the hind wings. Legs dusky, broadly ringed with white.

Length of fore wing, .64 inch. Edwards.

Differs from any of the succeeding species by its clear, cloudy ash color, and want of any brown or ochreous tints.

Cidaria subochreata n. sp. ♂, ♀.

Palpi long, acute. Body and wings dull rusty brown, with scattered white scales. Head, palpi, and body concolorous. Fore wings dull rusty brown; a darker band across the base; the outer edge zigzag, consisting of three acute points, that in the median space the largest, very acute ; beyond, is a paler band, which is succeeded by a little wider, dusky band, becoming narrower on the inner edge. A lighter median band, enclosing the oval discal dot; this band varies

in being brown or white, and is in the female twice as wide as in the male, and varies in width in the latter. This median dark or white region is scalloped externally with a large toothed subacute projection in the middle of the wing, being straight on the costa, and on the inner edge. In some specimens this outer edge of the median band is clearly resolved into two, and in the single female three, brown, parallel, contiguous wavy lines. The outer edge of the wing is clear, rusty brown, with a row of obscure dusky patches half way between the scalloped line and the outer edge of the wing. A submarginal row of longitudinal, intervenular, black linear spots. A black line at the base of the fringe, and a dusky line along the fringe. Hind wings dusky ochreous, brighter on the outer third of the wing; a slight discal dot, a brown, interrupted line along the base of fringe, which is dusky brown. Beneath, bright ochreous on both wings, a broad, dusky band angulated in the middle of the wing, in the female consisting of two brown lines ; this band disappears towards the inner edge; on hind wings an outer much curved brown line. Brown discal dots present on both wings.

Length of fore wing, .50–.58 inch. Edwards.

This species varies much in the central part of the wing, the band enclosing the discal dot varying from brown to white, and the angle of the outer edge being acute or rounded. It differs from all the other species known to me by the bright, ochreous underside of both wings, and the dusky band bent at nearly right angles.

Cidaria leoninata n. sp.

This is a smaller species than the foregoing, with long, acute palpi, and antennæ ciliated as usual. The body and wings are tawny brown, with scattered patches of ochreous scales. Palpi tawny, with scattered white scales. Front ochreous, with brown scales. Fore wings with three broad, dusky bands of nearly equal width, angulated on the median space, and scalloped on the edges, which are black; those of the second and third bordered with white. The second and third with the band between, form a central, dusky band, occupying a third of the wing, and containing an indistinct, brown, discal dot; the outer edge of the band is less angulated than in the two preceding species, and consists of three large scallops, being straight on the costal and subcostal region. A submarginal row of brown patches, margined externally with white points ; towards the apex are three longitudinal black streaks, with an oblique, black, apical streak, interrupted by the venules. A row of marginal black dots. Fringe

brown, pale at base, and checkered with dusky spots. Hind wings tawny, rather dusky on inner two-thirds, with the usual marginal row of fine, black dots. Beneath, ochreous dusky on the inner two-thirds of wings, the outer edge of the dusky area indented on the independent vein, and going from the second median obliquely inwards. Two minute black patches on the costa, near the apex an apical black spot. Fringe checkered with dusky spots.

Length of body, .40; fore wing, .47 inch. Edwards.

Cidaria rubro-suffusata n. sp. ♂, ♀.

In this interesting species the palpi are rather short and blunt, hairy, the front being unusually hairy, the scales standing up more than usual. Body and antennæ black, with scattered white scales. The fore wings suffused with red as a ground color, the hind wings clear brick red. Fore wings thickly covered with dark bands; base of wing blackish, succeeded by a narrow, reddish brown line, slightly curved; beyond, is a dark band scarcely curved, and succeeded by a salmon-colored band, with a dark, thread-like line running just beyond its middle. The middle of the wing is blackish, with three black, wavy lines running through it; the discal dots, round and black, being situated nearly on the innermost of the three. This broad, dark band, is more curved on its inner side in the ♂ than ♀, and is narrower. The outer edge is sinuate, with a dentate projection on the first median space. Beyond this band is a clear, dull, salmon-colored band, with a wavy, dusky line running through it, while the edge of the wing is dull brown. A marginal row of black, subtriangular spots, fringe brown at base; beyond, obscurely checkered with reddish and dusky spots. Hind wings brick red; about six short, fine, wavy lines on the inner edge; a very distinct row of black, marginal, intervenular spots, and fringe as on fore wings. Under side of both wings red; hind wings deeper red than fore pair, crossed by fine, black, interrupted lines, three on each wing; discal dots black, and costa of fore wings with about seven black dots, the subapical one largest; fringe as above, but duller.

Length of body, .30; fore wing, .44–.50 inch. Nevada. Edwards.

This species may at once be recognized by the brick red hind wings and underside of all the wings; the hairy front, and blunt, hairy palpi.

Cidaria 4-punctata n. sp. ♂, ♀.

Front gray, with a few yellow scales, orbits whitish, palpi tipped with whitish; four black dots on thorax, and one at the base of the

patagia, which are tipped with black; a few golden yellow hairs are scattered over the thorax. Two rows of black dots along the abdomen; edges of the wings white. Legs black, ringed with white. Fore wings pale gray, crossed by numerous wavy and zigzag white lines, and numerous black, costal stripes; five whitish, zigzag lines before the discal dot; these lines are edged with black, the basal one on the inside, the fourth on the outside. The discal dot is in a clear space, occupying the middle of the wing, with a costal band just over it; there are ten of these short, costal black bands. Beyond the costa is a double white line with large scallops terminating on the costa. A submarginal, more finely scalloped whitish line, parallel with the outer edge. Between these two lines, and about as far from the apex as the costa, are several black, irregular dots, a part of them sometimes forming a short, black line, bordering the extra-discal whitish line. All these lines are accompanied by scattered golden scales. A row of black spots at the base of the fringe, composed of two twin subtriangular dots, opposite to which the pale, gray fringe is checkered with dusky. The discal dot is oval, black and conspicuous. Hind wings whitish, entirely clear, with the fringe lineated at the base, and otherwise as in the fore wings.

The under side of the wings is tinged with salmon color, becoming deeper towards the apex of the fore wings. Costa edged with black to just beyond the discal dot, which is large and prominent. A subapical, broad, subtriangular black patch, extends from the costa to the first median venule. A discal dot present on the hind wing; fringe more distinctly checkered with black than above, and with a heavier black line on the edge of the wing, interrupted by the venules.

Length of body, .40; fore wing, .55 inch. Edwards, Behrens.

This seems to be a common species.

Cidaria multilineata n. sp. ♂.

This species is closely allied to *C. 4-punctata*, but is a little smaller. Front gray, a chocolate-colored band between the antennæ; a black spot on the front of the basal joint of the antennæ, vertex behind the antennæ whitish. Orbits and palpi reddish brown, the latter white beneath at base. Prothorax reddish brown, abdomen pale gray, with a pair of diverging pale brown spots on each abdominal ring. Fore wings with eleven costal black marks, being the termination of as many lines crossing the wing with varying degrees of distinctness. Two dark, wavy lines near the base of the wing,

the outer one bordered externally with white; then succeeds a pale, brownish band, with a few black dots, composing an obsolete line, but well marked on the costa; beyond, a row of white spots, beyond which is a broad ash band, like one just beyond the discal dot, which is distinct, oval, black, and situated in a band of clear gray bordered with scalloped dark lines. Beyond the extradiscal broad dusky band, is a row of white spots succeeded by two rows of minute black dots on a clear ash ground. A submarginal, distinct, white scalloped line, and a marginal black line, consisting of two intervenular black dots; the lines are externally edged with scattered groups of reddish scales. The fringe is white, checkered with dusky. Hind wings pale ash, outer edge dusky with a submarginal pale line; edge of the wing and fringe as in fore wings; a minute linear discal dot. Beneath, four discal dots of equal size and very distinct; both wings pale whitish gray with two obscure extradiscal lines, and a submarginal, diffuse, half effaced dusky line on both wings.

Length of body, .40; fore wing, .55 inch. Edwards.

Eubolia custodiata Guen., ii, 491.

Chesias occidentaliata n. sp. ♂, ♀.

The fore wings are lanceolate oval, the outer edge of the wing being very long and oblique, and as long as the inner edge of the wing. It is russet brown, the vertex being considerably paler than the front of the head and palpi. The antennæ are finely ciliated beneath. Fore wings russet brown, with dark scales along the veins and their branches. No markings or transverse stripes. The discal dot is large, round, black, distinct, and the wing is a little clear towards the apex, both along the costal and inner edge. Along the costa are faint brown spots, especially above the discal dot, where four of them are slightly marked. Hind wings clear russet ash, paler than the fore wings, but dusky along the inner edge; with three, short, wavy lines, one at the inner angle, the other two approximate and nearer the middle of the inner edge. A pale line along the middle of the abdomen, interrupted by black dots; a similar stripe runs along each side.

Length of body, .42; fore wing, .54 inch. Edwards.

Baptria Californiata n. sp.

This pretty species is black, with three narrow, waved white bands crossing the fore wings; the two basal ones connect on the inner edge of the wing, where they form a circular ring, enclosing a black spot; above, they are equidistant, and are dentate on the median

vein, the teeth advancing towards each other. The outer line is very sinuate, widening in the middle and thence sending a linear sinuate line to the inner angle of the wing. Close to the outer edge of the wing, and opposite the rounded bend in the outer band is a round, white spot. A minute white spot on the inner angle. Hind wings with a large, black, oval discal spot ; beyond, an indistinct black line, and beyond this a broad, white band, widening outwards in the middle and connected with a round, marginal, white spot ; another white spot on the inner angle. These markings are distinctly repeated on the under side of the wings.

Length of body, .35 ; fore wing, .47 inch. Behrens.

[While correcting the proofs of this article, I was informed by Prof. Zeller of Stettin, in time to make the change in the proof, that the *Choerodes ægrotata* (Guen.), which I had sent to him under a different MS. name, supposing it to be undescribed, is the *Tetracis ægrotata* of Guenée. It agrees with his description, but his determination of the genus misled me, and I am fortunate in being set right by so critical a lepidopterist as Prof. Zeller.]

New or Rare American Neuroptera, Thysanura, and Myriapoda.

By A. S. Packard, Jr., M.D.

My apology for presenting these isolated descriptions is, that they add considerably to our knowledge of the geographical distribution of these groups of insects in North America, and may serve to stimulate observers to look more carefully for the species of the less familiar groups of insects.

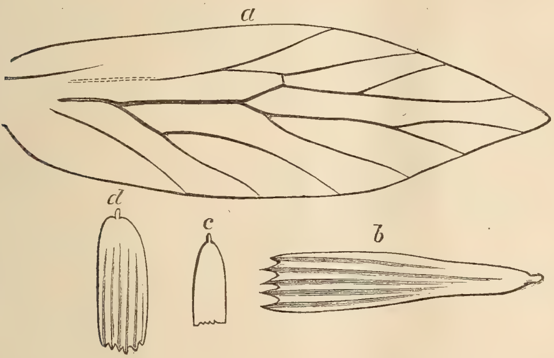
NEUROPTERA.

Amphientomum Hagenii n. sp.

The body, generally, is of a pale, yellowish horn color. Head of the same color, with a few scattered hairs. Eyes full, round, prominent, subglobose. Ocelli arranged in a very low, flat triangle ; the anterior one being on a line with the front edge of the eyes. Behind each of the two basal ocelli, is a blackish brown line, so doubled as to form three sides of an oblong square, with the open side facing the anterior ocellus, the inner sides meeting midway between the ocelli. A dark brown, narrow line extends from eye to eye, passing upwards in the middle, between the anterior and the other two ocelli. A

dark, broad line extends from the eyes to the clypeus. The anterior ocellus is surrounded with black, and there is a pair of divergent dark brown lines, a little curved, sending a branch up to the anterior ocellus. Two curved, dark brown, broad, short bands just above the clypeus. The clypeus is free, raised above the surface of the front, and is pale horn color (testaceous), and unspotted. Labrum black. Mandibles pale, pitchy. Antennæ with the basal joint globular; the second a little longer, oval, both very much larger than the sixteen succeeding pale horn-colored joints, the latter being slender, gradually increasing in length to the tip, each joint provided with four or five long, stiff hairs, giving a verticillate appearance to the antennæ. Seen in front the difference between the eyes is equal to the distance from the vertex to the base of the clypeus, the front being equilaterally triangular. Legs testaceous, the femora pale at base; beyond, a little dusky, the tibiæ twice broadly ringed with dusky; tarsi pale. Prothorax very short, the tergum being transversely linear; mesoscutum cordate. Abdomen pale, almost whitish. Upper wings regularly oval lanceolate, the tips being acute, but not prolonged; densely covered with hairs and scales, with the fringe long on the outer half of the wing, and increasing in length towards the tip so that the outline of the fringe is oval. Under the microscope the wing membrane is covered with numerous dots, arranged in irregular wavy rows, the dots much thicker along the edges than elsewhere. In the middle and along the costa the hairs are developed into regular flat scales, like those of the Lepidoptera, and the Lepismatidæ and Poduridæ, varying greatly in form, some being long and narrow, with acute teeth on the outer edge, and a rather large point of attachment; others broad and short, with blunt teeth, and others more regular in outline; all with shaded lines proceeding from each tooth and fading out towards the base of the scale. (See figure, *b*, *c*, *d*, drawn to the same scale with the camera.) The wings are glistening gray, and spotted irregularly with dark towards the tips. Venation: in the fore wings (*a*) a minute, almost obsolete costal vein, four subcostal venules; the main vein at the origin of the second branch anastomoses with the median vein, forming a long, narrow discal cell; at one-third the distance between the anastomosis and the tip of the wing it sends off a third branch nearly equalling in length the two basal ones; the median vein has five branches; after sending off a branch to anastomose with the subcostal vein, it subdivides, the upper branch again subdividing midway between the tip and the

anastomosis. On the basal fifth of the vein a branch arises, which subdivides, forming the fourth and fifth median venules. A straight,



submedian vein is present. Hind wings similar in form to the fore pair, but a little narrower ; a slightly marked subcostal vein, ending opposite the origin of the first and upper branch of the median vein. The median vein subdivides into five branches, the three basal, lower ones arising at nearly equal distances apart, and of nearly the same length; the first and upper one arising on the outer fourth of the wing; a slightly marked submedian vein. The wings are folded at a low angle over the back.

Length of body, .10 ; of body with the wings folded, .14 inch.

I first observed this insect under the loose bark of a stump, moving in groups of several, running swiftly when disturbed, like other Psoci, to a place of concealment, at Brunswick, Maine, early in July. I also found a specimen Sept. 1st, in Salem, Mass.

Dr. Hagen, the founder of this genus, kindly drew my attention to the great interest attaching to the discovery of this insect in this country, indicating the genus, and that the species was undescribed. In his paper in the " Entomologists' Monthly Magazine," he describes this and the allied genus Perientomum, and describes of the present genus two species from amber, two from Zanzibar in gum copal, and three living forms from Ceylon.

Psectra dipterus Burm.

I took a specimen of this exceedingly rare Hemerobiid insect, at Brunswick, Maine, Sept. 16th. On showing it to Dr. Hagen, he

considered it as the same as the European insect. It is very rare in Europe, one specimen only having occurred in England, two or three in Germany, and one in Siberia, as Dr. Hagen informs me.

It agrees perfectly with Mr. McLachlan's description (Trans. London Ent. Soc. 1868, p. 170) and agrees pretty well with his figure, though the abdomen in my specimen is blunt and rounded. Unfortunately my single specimen is in too poor a condition to be figured.

Boreus Californicus n. sp.

This species is more nearly allied to *B. hyemalis* Linn. of Europe, than to either of our eastern species, *B. nivoriundus* and *B. brumalis* of Dr. Fitch. It is about twice as large as *B. nivoriundus*, the female, including the ovipositor, measuring .20 of an inch, the ovipositor being .07 inch in length, while the male is .16 of an inch in length. The body in both sexes is greenish black, with slight metallic reflections. The middle of the beak is light brown, pitchy, the base and tip being black. Antennæ and palpi black. The membranous area behind the head and below the protergum is dark horn color. The wing pads of the female are rounded semi-elliptical. The rudimentary wings of the male are dark horn color, darker at tip; they extend to the base or middle of the fourth abdominal segment. Legs dark horn color, a little darker at the joints; the tarsi a shade darker, with the terminal joint blackish. The ovipositor is dark horn color, black at base and tip, or entirely blackish beneath. The whole body is covered with minute white hairs.

In a pair preserved still sexually united, the abdomen of the male (beneath the female as usual in this genus) is considerably elongated, directed upwards perpendicularly, and held between the blades of the ovipositor which gape open widely, the male abdomen reaching into the very base of the ovipositor.

Several specimens in the Museum of the Peabody Academy of Science were received, together with valuable collections of other insects, from Mr. Junius Holleman, who collected them near Fort Bidwell, Siskiyou Co., Cal., Dec. 11th. They were observed walking on the snow in the morning, disappearing when the sun shone brightly at noon.

It represents in California the European *B. hyemalis*, rather than our two eastern species, and is another interesting example of the European facies of the Californian insect fauna.

THYSANURA.

Campodea Americana n. sp.

This species is closely allied to the European *C. succinea* Nicolet, but seems to differ in the body being very transparent, and of the same color as the appendages; like that species the anal appendages are 14-jointed. It is throughout of an amber yellow color. The antennæ have the basal joint short and about one-fifth broader than the succeeding ones, and is short, about one-half as long as broad, being obliquely truncated, the outer side being the longer. The anal appendages are long and hairy, the joints gradually increasing in length until the terminal one is lanceolate oval, and nearly as long as the 10th abdominal segment is broad; between their bases is the broad triangular 11th tergite. The hairy, single-jointed tarsus is as long as the tibia, and ends in two rather long curved claws. The prothorax is considerably narrower than the head; it is about one-half as long as broad, sublunate, much rounded behind; the mesothorax is as round as the head, well rounded in front, and very free from the prothorax, under which it moves; the hinder edge is square, slightly rounded; metathorax square in front, a little rounded behind, especially on the sides.

Abdominal segments very equal in length, with the sides a little produced posteriorly, terminating in a bristle. The abdominal lateral locomotive spines are slender, acute, 2-jointed, the basal joint a little longer than broad; the second joint moving like a finger backwards and forwards, acting both as abdominal supports and as locomotive organs. The head and body are covered with fine yellowish hairs.

Length .12 of an inch.

I found these specimens in Salem, under a stone in damp soil early in April. This is the first occurrence of any of this family (*Campodeæ* of Meinert) in the United States. A species of *Japyx* (*J. Saussurii* Humbert, Rev. et Mag. Zoologie 1868, p. 345,) was discovered in Mexico by Prof. Sumichrast, and it should be looked for in Texas and the neighboring states.

MYRIAPODA. (PAUROPODA.)

Pauropus Lubbockii n. sp.

While looking over a chip with Myriapods and Poduras on the under side, brought in from the grounds of the Museum of the Peabody Academy, at Salem, Nov. 10, 1870 (while the present article

is going through the press), by Mr. C. A. Walker, I detected a lively little yellowish white creature, which immediately suggested Sir John Lubbock's *Pauropus*. A closer examination showed that it was indeed a species of *Pauropus*, very closely allied to *P. pedunculatus* Lubbock, and intermediate in the form of the antennæ, between that species and *P. Huxleyi* Lubbock. It may be called *Pauropus Lubbockii*, in honor of the original discoverer of this remarkable type of Myriapods. No more interesting articulate, as Lubbock remarks, has been discovered for many years; and the occurrence of a species in America is worthy of note. Lubbock (Trans. Linn. Soc. XXVI, p. 181–190, 1867,) has given a detailed descript on of the genus, and an able discussion of the value of the group which it represents, which he considers as an order equivalent to the Chilopods on the one hand, and the Chilognaths (Diplopods) on the other, and for it suggests the name *Pauropoda*.

It differs from other Myriapods in having but nine pairs of legs, and bifid antennæ terminating in singular sensory appendages. The mouth-parts resemble those of the Chilopods in a rudimentary condition, and there are no tracheæ. The species are of remarkably small size, though shown by Lubbock to be mature, as he found spermatozoa developed in them. The young have but three pairs of legs, as do the young of other Myriapods so far is as known. "This little genus, therefore," as Lubbock remarks, "does not possess the characteristics of either order of Myriapods, but forms a link not only connecting the Chilopods and Diplopods together, but also bridging over to a certain extent the great chasm which separates them from other Articulata."

P. Lubbockii differs chiefly from *P. pedunculatus* Lubbock, to which it seems more nearly allied than *P. Huxleyi*, in the multiarticulate process on each branch of the bifid antennæ being of nearly equal length. The bulbous termination, somewhat resembling the end of a tenant hair on the feet of the Poduridæ, and other insects, is not globose, but subconical, the base being swollen. The form of the antennal joints and their hairs, and the third multiarticulate appendage to the fourth joint, is the same as in *P. pedunculatus*. The form of the ringed, pyriform organ, situated between the two appendages of the fourth antennal segment, closely resembles that of *P. Huxleyi*, the organ being sessile and much smaller than in *P. pedunculatus*. In other respects, such as the form of the body and the blunt hairs scattered over it, the legs, and claws, and the median appendages at the

end of the terminal segment of the body, our species agrees closely with *P. pedunculatus.* It is of a decided yellowish tint, and .03 of an inch in length. It is very active in its motions, and like the Poduridæ, which apparently respire through the skin, soon dies on being deprived of moisture.

Section of Microscopy. May 11, 1870.

Mr. E. Bicknell in the chair. Eight members present.

Mr. G. F. Childs was elected a member of the Section.

Mr. Stodder exhibited a section of Tiger wood from Brazil. The wood was very hard, many of the cells being entirely filled with incrustations deposited in layers. The medullary rays were quite small and also filled with a deposit which could easily be dissolved by alcohol; the medullary rays also contained large quantities of crystals, which were formed more sparingly in the other portions of the wood. He also exhibited living spores of *Equisetum.*

May 18, 1870.

Vice President C. T. Jackson, in the chair. Forty-four persons present.

Dr. Thomas M. Brewer exhibited a nest of the Baltimore Oriole (*Icterus Baltimore*) from Florida, composed of Spanish moss, (*Tillandsia usneoides*) verifying the position of Audubon who has both figured and described the oriole's nest as composed of this plant. He said it had since been

denied that this bird builds its nest where the *Tillandsia* grows.

Mr. W. T. Brigham exhibited photographs of two meteorites from Tucson, Arizona; the extreme diameters of the larger one were 49 by 39 inches. It had a central opening, being formed like an irregular ring, and weighed 1600 pounds; the smaller one, which was solid, measured 49 by 18 inches. They were found in sand.

Dr. C. T. Jackson called attention to the fact that no meteorites had been found below the modern surface. Though when exposed to moisture they might be dissolved and disappear from the deeper strata, yet in many substances, as in clay and mud, impervious to aerated water, they would be preserved; and he inferred from this that the fall of meteorites was of comparatively recent occurrence, *viz.*, since the Tertiary Strata were deposited. Some meteorites are characterized as stony, others as metallic; yet metals, as cobalt, iron, nickel, entered into the composition of all.

It was interesting, he said, to note that the examination of meteorites disclosed no materials which were not common to the globe. New combinations, however, had been discovered. Iron, phosphorus and nickel had no where else been found combined.

A large meteoric mass fell in Bavaria which cut and polished like steel. Another mass, weighing 3000 pounds, was found on the bank of the Red River, which is now preserved in New Haven. A fall of red hot stones attended by frequent explosions occurred in India. One of these stones was sent to this Society. On the surface, this specimen was fused to glass. These stones were intensely cold to the touch.

Dr. Jackson, in his closing remarks, expressed regret that the Society possessed no collection of meteorites.

Mr. Brigham made a few remarks on a deposit of lava on the Columbia River, which had been cut through and exposed by the action of water. Though the strata differ mechanically, he said they were substantially the same. Whether these deposits were derived from Mt. Hood, which is still active, or from some extinct volcano, is not known.

He also presented to the Society a photograph of one of the Redwoods, (*Sequoia gigantea*) known as the "Grizzly giant"; and described it as forming part of the Mariposa Grove. Ten inches of its surface had been burned away. A branch eighty feet from the ground was six feet in diameter. He said the skeleton of another giant remained; but the trees with few exceptions had been injured by fire.

Mr. Brigham also exhibited a specimen of *Morchella* from Grafton, Worcester County, Mass. This fungus was found somewhat abundantly in an orchard, growing in lines which apparently marked the radiating roots of the trees. He said it was edible, but whether the true *esculenta*, or some other species, he could not determine.

Dr. F. H. Brown exhibited mounted specimens of Ferns and Fern-allies from Madeira and Porto Santo, and presented the following list of species which have been discovered in these islands: —

Order FILICES. (Ferns.)

Adiantum Capillus veneris.
" reniforme.
Aspidium angulare.
" falcinelle.
Asplenium acutum.
" anceps.
" axillaris.
" furcatum.
" Hemionitis.
" lanceolatum.
" marinum.
" monanthemum.
Athyrium filix-fœmina.
Balantium culcita.
Blechnum spicant.
Ceterach officinarum.
Cheilanthes fragrans.
Cystopteris fragilis.
Davallia Canariensis.
Elaphoglossum squamosum.
Gymnogramma Totta.
" leptophylla.
Hymenophyllum unilaterale.
" Tunbridgense.

Nephrodium affine.
" elongatum.
" fœnisecii.
" frondosum.
" molle.
" oreopteris.
" spinulosum.
Nothoclæna marantæ.
" vellea.
Ophioglossum.
Polypodium drepanum.
" vulgare.
Pteris aquilina.
" arguta.
Scolopendrium vulgare.
Woodwardia radicans.
Trichomanes radicans.

Order EQUISETACEÆ. (Horse-tail family.)

Equisetum Telmateia.

Order LYCOPODIACEÆ. (Club-moss family.)

Lycopodium complanatum.
" denticulatum.
Lycopodium suberectum.

Mr. W. H. Niles made the following remarks upon the system in the physical features of Massachusetts.

To arrive at a clear conception of the first principles involved, Massachusetts must be considered as a portion of the North American continent. An analysis of the continent discloses how certain laws of its structure are the foundation of those features included in this State. Such an analysis shows Massachusetts to be situated upon the Eastern Slope of the Northern Section of the Appalachian Mountain System. Her location upon the Eastern Slope gives the law that the ranges increase in height from the eastern side of the State to the western side. Her position in the Northern Section, south of the parallel of culmination, which passes through the Adirondack, Green and White Mountains, gives the law that the general surface increases in height northward. Sections running entirely across the State, in east and west, or in north and south directions, show that these laws are of primary value, in accordance with which the fundamental features of the surface now appear.

An analysis of the State itself, shows that it is traversed, in northerly directions, by four distinct physical regions; two of which are high lands, and two are low lands.

The eastern portion of the State has usually been pronounced to be much broken and very irregular. Mr. Niles said that he had

been able to trace some distinct ranges, some of which he briefly described. Most of these show a general parallelism with the other Appalachian ranges. But the Blue Hill range of Milton and Quincy, trends east and west, and other ranges of low hills, in the vicinity of Boston, are approximately parallel. The general strike of the rocks usually appears to be nearly parallel with the trend of the hills. He believed these east and west ranges to be axes of elevation produced by a secondary force, which acted in a somewhat different direction from the primary one which determined the prevailing course of the Appalachian Mountain System.

Such is a very brief and general statement of a subject which Mr. Niles hoped to bring before the Society at some future time, in a more complete form, illustrated by a map which is now in preparation.

Mr. Hyatt proposed the following change in Art. VI of the Constitution; that the words, "after having been nominated at a preceding meeting," be inserted after the word "ballot," so that the article shall read: Officers shall be chosen by ballot, after having been nominated at a preceding meeting, and a majority of votes shall be necessary for a choice.

Mr. J. A. Allen was transferred from the committee on Ornithology to that on Reptiles and Fishes.

The following gentlemen were elected members of Department Committees.

Mammals. J. A. Allen, Thomas Waterman, Jr., M. D., J. B. S. Jackson, M. D.

Comparative Anatomy. Thomas Dwight, Jr., M. D., Jeffries Wyman, M. D., J. C. White, M. D.

Microscopy. Edwin Bicknell, R. C. Greenleaf, B. Joy Jeffries, M. D.

Ornithology. J. Elliot Cabot.

Section of Entomology. May 25, 1870.

Mr. P. S. Sprague in the chair. Nine members present.

Mr. F. G. Sanborn reported the recent capture of some interesting Lepidoptera at Milford, N. H.; among them a singular variety of *Lycæna lucia*, ♀, several *Hesperidæ*, *H. vialis*, *metea* and *samoset*, besides abundant specimens of *Nisoniades icelus*, *ennius* and *perseus*.

He also gave an account of some observations recently made by him at Milford, N. H., on the habits of the *Termes flavipes* Koll., when removing their young to a place of safety; in which labor the soldiers did not assist, but rather impeded the operations of the workers. Some few of the latter in exploring the ground for stray larvæ, fell a prey to the extremely small red ants, a colony of which species was established beneath a corner of the same stone that roofed the abode of the *Termes*.

Mr. Edward Burgess informed the Section that Dr. Hagen would probably bring with him on his return from Europe, his entire collection of Neuroptera, the largest in existence. He had been told, he said, that Dr. Hagen desired specimens of all Phryganeidæ, preserved by pinning; not put up in papers like Lepidoptera, as this treatment injured them irrecoverably.

Wednesday, June 1, 1870.

Dr. C. T. Jackson in the chair. Thirty-five persons present.

Mr. Edward S. Morse made a verbal communication on the Position of the Brachiopoda in the animal kingdom. He exhibited living specimens of Lingula, which he had procured during a recent visit to the coast of North Carolina,

and said he was prepared now, after long and careful study, to state that the Brachiopods were not mollusks, but true articulates; and that their proper place was among the worms, forming a group near the tubicolous annelids.

This communication will appear in full in the future pages of these Proceedings.

Mr. A. Hyatt acknowledged himself an unwilling convert. He said their mutual labors to establish the name Saccata, instead of Mollusca, had given him a deep interest in the result of Mr. Morse's investigations. He spoke of the complete evidence presented of his position, and alluded to *Phoronis hippocrepia* in confirmation of Mr. Morse's view of the annelidan structure of Polyzoa; the only difference between Phoronis and the Polyzoa lying in the digestive system, the termination of the intestine being probably near the posterior end of the body, instead of near the mouth as in Polyzoa.

Dr. Charles Pickering said, in the Feejee Islands the Lingula was found abundantly in the brackish waters of the estuary of a large river, which is barred at its mouth by coral reefs. He also referred to the fact that the oldest geological Lingula was as perfect as those found to-day, as fatal to much modern theorizing.

The following paper was presented:—

Geological Sketch of the Argentine Republic.

By Dr. G. A. Maack, Cambridge, Mass.

Since the year 1789, when a complete skeleton o[illegible]gatherium was found in the bank of the river Lujan, one and a half leagues southwest of Buenos Ayres, which was sent the same year by the Marquis De Loreto, at that time governor of this Spanish Vice-royalty, to Madrid, where it at present forms one of the most valuable treasures of the Royal Museum of Natural History, and further since the travels of the celebrated French and English naturalists, Mr. Alcide D'Orbigny and Mr. Charles Darwin, over the La Plata States, the scientific interest in the nature of this large and

extensive country of South America has increased among naturalists every year. During the last twenty years, especially, Prof. Herman Burmeister, the present director of the Museo Publico of Buenos Ayres, and Mr. Aug. Bravard, for many years director of the National Museum of Paraná, have devoted themselves to a very careful study of this region. During my stay in that country I had also the opportunity of getting an insight into the nature of those, for a naturalist, very interesting and instructive parts of the world. I owe a good deal to Prof. Burmeister, and to many other friends, for valuable information and assistance. If I therefore try to present to the Society some general outlines of the geology of the Argentine Republic, it is also my duty to return my best thanks to those gentlemen.

Unparalleled as the fact is, we find hardly another country in the world which possesses in its geographical formation such a sharp circumscription as has the Argentine Republic. In the western part we have the Cordilleras de los Andes, extending nearly from one end of America to the other, and running more or less always in the same meridional direction, that is to say, from the south to the north; while in Europe and Asia, all the greater chains of mountains, with few exceptions, have just the opposite direction, from the west to the east, that is to say, the parallel direction. But this characteristic direction of the Andes is one of those important causes which have a determining influence upon the development of unorganized nature, as well as upon that of plants, animals and even mankind.

Almost everywhere in Europe and Asia we find the surface of the globe divided by parallel chains of mountains into several transverse sections, which have their own river systems, their special geological, as well as botanical, zoological and ethnographical relations. In South America, and especially in the La Plata States, we find just the contrary; there the meridional direction and the very slightly inclined descent to the east have formed large and extensive plains and rivers; the latter are augmented in volume very much by the atmospheric moisture, which amounts during the year to from 926 to 2920 millimetres; but they are separated from one another by comparatively low watersheds. The distribution of plants and animals also extends there over a larger area than elsewhere, because the climatic and geological influences are of a more uniform character; the general elevation above the level of the ocean has, in this respect, a more direct and active

influence than the configuration of this elevation. In short, all the natural circumstances in the Argentine Republic are of such a character that they afford broader and more extensive areas for the development of the same geological formations, as well as of the same plants, animals and human beings, and make the transition from one specific organic province to another less abrupt and more evident. But just for this reason, the Argentine Republic is to the naturalist one of the most instructive countries for studying the distribution of plants and animals, as well as their dependence upon the geological constitution of the country.

This La Plata plain, the western boundary of which, as I have already mentioned, is formed by the Cordilleras de los Andes, extends from the 22d to the 52d degree of south latitude, and embraces, inclusive of Patagonia, an area of 1,281,000 square miles, with 1,710,000 inhabitants. This area forms, with the plain of the Orinoco and Venezuela, and that of the Rio Negro and of the Amazons, the three great divisions into which the low lands of South America can be divided. Generally speaking, this La Plata plain consists of two entirely different parts, the limits of which are traced by a line commencing at the foot of the Cordilleras under the 31st degree of south latitude, near San Juan, and running over San Luis della Punta, La Reduccion, and Frayle Muerto to the Rio Salado, which discharges itself into the river Paraná.

The influential character of this line is especially produced by the Sierra de Cordova and its branches, the elevation of which has a meteorologic influence of the first rank, and consequently an influence also upon the development of plants and animals. This characteristic feature of the Sierra de Cordova has led the national government of this Republic to erect an observatory at Cordova, the capital town of the province, which lies eleven hundred and seventy-eight feet above the level of the ocean, under the direction of the distinguished American astronomer, Dr. Gould, of Cambridge. No doubt Dr. Gould will make, during his stay in that country, important meteorological observations, and contribute in this way much towards a better understanding of its different physical features.

The great value of a correct observation and understanding of the different physical and meteorological phenomena, is clearly shown by the following striking fact. In general, the land of the north-western provinces is not fertile, and the vegetation is

very poor; only rich in Leguminous and Opuntiaceous plants. But on the contrary the province of Tucuman, lying in the northwest between Salta, Catamarca and Santiago del Estero, is one of the most fertile and beautiful parts of the whole country; in consequence of which it is called "the garden of the Republic."

The explanation of this, at first sight, striking and apparently unnatural fact, is very easy and natural. The high mountains of Aconquija, lying on the western and southern side of this province, are covered, during the whole year, at their highest point, (fifteen thousand feet above the level of the ocean) with snow, and consequently condense the atmospheric moisture and so produce rain enough to render the land fruitful.

The river Paraná forms the limit between that plain and those eastern provinces of the Argentine Republic which are called, in consequence of their great fertility, "la Mesopotamia Argentina," namely Entrerios, Corrientes, and Missiones. The provinces Entrerios, Corrientes, Missiones and Santa Fé are called River-provinces (provincias ribereñas) because they lie on the Paraná; which river, after joining the Uruguay, coming from the southern Brazilian province Santa Catharina, bears the name Rio de la Plata. Cordova, La Rioja, Santiago del Esero, Tucuman, Catamarca, Salta and Jujuy are the upper northern provinces, and San Luis, Mendoza and San Juan, the northwestern provinces, or the "Provincias de Cuyo," the word "Cuyo" belonging to the language of the Indian tribe "Araucans," and signifying sand.

When we arrive at Buenos Ayres, our first impression of the country is that of a very large plain. The elevation above the level of the ocean around the city is very slight, only about ten feet; but as we go higher up the Paraná the elevation is greater; namely, at Rosario 53 feet, at Paraná 90 feet, at Corrientes 200 feet, at Asuncion 265 feet, and at the limit of the Republic under the 22d degree of south latitude, 300 feet. We see a similar rise if we turn to the northwest; this elevation is at first very slight, but the nearer we come to the chains of mountains, the elevation increases, and reaches at Mendoza an altitude of 2354 feet, and at Copacavana in the province of Catamarca, an altitude of 3597 feet. Likewise the other northern provinces, Tucuman, Salta and Jujuy, lie very high above the level of the ocean, and join their chains more or less with those of Bolivia. From these northern regions spring the three most important and navigable river-branches of the Paraná; the

Pilcomayo, the Rio Vermejo (the South American Missouri) and the Rio Salado, which flow directly from the northwest to the southeast, and in this way show very clearly the characteristic geographical structure of this Republic.

It is a curious fact that as soon as we have left the southern part of the province of Tucuman, where the elevation is from 1600 to 1800 feet, the land descends suddenly in the province of Santiago del Estero to a height of 500 feet, but in the province of Cordova increases again and reaches in some places even a height of 2600 feet. Then the land descends continually, not only to Buenos Ayres, but further south, to the Magellan strait, except under the 38th degree of south latitude, where the line of descent is interrupted by the chains of Tapalquen, of Tandil, of Volcan and a little farther southwards by those of Ventana; the former reach a height of 1000, the latter of 3000 feet.

As I have already stated, the rivers Pilcomayo, Vermejo and Salado, coming from the northwestern mountains, possess fall enough to reach without interruption the Paraná; this is not the case with those many smaller rivers which rise in the mountain-chains of Cordova; their fall, except the Rio Tercero, is very slight, in consequence of which they are not able to reach the Paraná, and form sometimes very small rivers or what is called by the native people, "arroyos." These arroyos are for a traveller very often great obstacles, because they make the ground boggy and impassable. The general direction of all these streams is from the northwest to the southeast.

But the two large and powerful rivers in Patagonia, namely, the Rio Colorado and the Rio Negro, coming directly from the foot of the Andes, have a very different character. Their direction is from the west across the main land to the east, and, without uniting during their course with any remarkable branch, except the Rio Neuquen with the Rio Negro, they reach the Atlantic Ocean as powerful and navigable rivers, and form in this way a natural passage between the Pacific and Atlantic Oceans. The Rio Negro especially will have an important influence upon the future development of Patagonia, because coal and salt are found in the neighborhood of the sources of its branch "the Neuquen," and also under the same latitude on the other side of the Cordilleras, near Talcahuano, in Chile. Indeed, the navigability of these two large rivers, with the discovery of coal and salt in their neighborhood, will have an important influence

upon the future development of Patagon a. But this is not all. To these natural advantages is to be added the easy and quick passage over the Cordilleras at the source of the Rio Negro. This discovery was first made in 1855, by Mr. Geise, a German engineer, who in behalf of the government of Chile made an examination of that country. Mr. Geise stated that it is possible even for a person to travel on foot in three days, without difficulty, from Puerto Mants, in Chile, to Patagonia. Finally, the natural formation of a large bay on each side, namely the bay of St. Matias on the east, and the bay of Chiloe on the west, will serve as good ports for commerce.

Taking a general view of the present geographic, orographic and hydrographic configuration of the Argentine Republic, it is evident that Nature has enriched the country with unusual abundance and plenty, and that only skillful and energetic hands are needed to give to this Republic that cultivation, and commercial and industrial importance which it should have reached a long time ago. In this respect there is a very large sphere of activity for the President, Mr. Sarmiento, as well as for the different provincial governments.

A natural question rises concerning the origin and character of these formations. Let us try to get a clear insight, considering first the *Alluvial.*

This formation, generally thin (not more than one to two feet thick) except in the river channel, covers the land, especially in the western part of the Republic, and consists generally of a very fine, brown or ashy sand, which contains microscopic grains of quartz mixed with finely comminuted clay and lime; the microscopic organisms, also, found in this "Pampa sand" are mainly Diatomaceæ; Foraminiferæ are never found, and hence we may conclude that this alluvium is a fresh water formation. In the neighborhood of rivers, also, we often find shells in this alluvial formation, as for instance, *Ampullaria australis* D'Orbigny, *Planorbis montanus* D'Orb., *Paludinella Perchappii* D'Orb., all of which are at present living in these rivers. The decomposition of these shells will of course afford a rich lime, the quantity of which at some points is so great that this alluvial formation has some practical value. This is also the case, for instance, with the sand of the bottom of the Rio de la Plata, which is used by the masons of Buenos Ayres for mixing with purer lime. This sand consists principally of the decomposed shell of *Azara labiata.* Similar localities are found at Belgrano, near Buenos Ayres,

further south at Quilmes, near Colonia del Sacramento and Montevideo, and near Bahia Blanca.

In all these different sediments, and also at the bottom of the larger rivers, we rarely find pebble stones; but as soon as we come nearer to the interior chains of mountains, these pebbles are mixed with the alluvial Pampa sand, and in large quantity cover the surface of the land. Especially is this the case in the neighborhood of Mendoza and Catamarca, where the specific character of the Argentine alluvium can be very well studied. Of course all these pebble stones are brought down from the chains of the mountains by the rivers. On account of the slight slope of the whole country these streams were not able to transport them further than to the Rio Paraná, or the mouth of the Rio de la Plata. For this reason we do not find them in the lower part of the Republic.

But as compensation for this want we find there a large mass of a very fine, sandy sediment, which has accumulated in such a quantity that it has already formed new land; for instance, "las Barracas" at the mouth of the stream "Riachuelo," the islands "San Fernando" and "las Conchas," northwards of Buenos Ayres; in one of which was found, some years ago, a skeleton of a whale, one and one-half feet below the surface covered with large willow trees. This accumulation commences also at the mouth of the Rio de la Plata. The fact is, that this La Plata bay is covered from year to year more and more with this fine Pampa sand, and that the present average depth of the La Plata between Montevideo and Buenos Ayres amounts to only six metres; to this obstacle to navigation, are to be added the many sand bars already formed in the lower portion of the river. No doubt some hundred years hence a delta like those now found at the mouths of the Mississippi, Ganges, Nile and Indus, will be formed at this place.

Below the alluvial formation lies the *Diluvium*, which is called especially "the Pampean formation." (*Formation pampeenne*, D'Orb. *Pampean mud*, Darwin). The color of this formation is always more or less red, and it extends, as we shall see afterwards, not only through the whole Republic, but further north, as well as to the south. Its average thickness is from ten to sixty feet. This formation consists also of sand, clay and lime; the lime forming but a comparatively small part of its substance. The only exception in which lime is the prevalent constituent part, is shown in that curious concretion of this formation which is called "Tosca," a true

marl mixed with clay and lime, and more or less sand. This Tosca is found especially near the coast of Buenos Ayres, where it forms large rocks which may be easily examined at low tide. The first impression is more that of a dissolved granitic rock; but a more careful examination shows that it is only a mechanical composition of clay and lime, containing some fine grains of quartz, and not at all a crystalized mass which could have been formed in a regular chemical way out of the diluvial sediment.

Just as these Tosca concretions are found only in a comparatively very small area of the Diluvium, so pebble stones are found in this pampean mud only at certain localities, namely, near the interior chains of mountains, especially those of Cordova.

More frequent and extensive than these two last peculiarities of the pampean formation are the "*Lagunas*," that is to say, lakes of salt water, which give to the whole country a peculiar character. They are always situated in the low lands, and their bottom consists of that impenetrable, red, pampean clay. They extend over a very large area, from the 23d degree of south latitude near the Rio Vermejo, to the 50th degree, but differ in this respect, that in the northwestern part the lagunas are more or less dry on account of the want of rain, while in the southern and eastern parts they are filled with water during the whole year. The fall of rain in these regions is nearly four times greater than that of the northwest. *Salinas* is the name given to the dry lagunas; but those larger plains in the south which, at the dry season are covered with an efflorescence of salt, are called "*Salitrates*." The Spaniards called this saline crust "*Salitrates*," because they believed that it consists of saltpetre; but this is not so; it is composed of Glauber's salt (NaO, SO^3) and gypsum (CaO, SO^3). These deposits are found especially near Bahia Blanca, and only at those places which lie but a few feet above the level of the ocean. At the southern Colony, "*El Carmen de Patagones*," near the Rio Negro, there exists a very large salina consisting almost entirely of common salt ($Na\ Cl$). In earlier years it was collected as an article of commerce, but it is too pure for this purpose; the want of other saline elements rendering it useless for salting meat. In Brazil and Uruguay, where the underlying rocks are of a granitic structure, these salinas are never found. In order to explain this curious phenomenon we must suppose that the greatest part of the Argentine Republic was covered at an earlier period by the ocean, and after its recession, these saline lagunas remained

in the lower parts of the land. That the ocean extended at an earlier period farther inland than it does at the present time, is proved as we shall see, by the fossil remains of the upper tertiary formation of this country.

The most characteristic feature of this pampa mud is the existence of large and bulky fossils, namely, Megatherium, Mylodon, Glyptodon, Toxodon, etc., the remains of which will always make upon every beholder a deep impression and stimulate him to further investigation regarding the nature of these fossil animals, as well as the sediments which enclose them. We owe, in this respect, a good deal of information to Messrs. Alcide D'Orbigny, Darwin, Owen, Bravard and Burmeister. The latter has devoted himself for the last eight years especially to a careful study of these pampean fossils, the results of which are very important. Through his extraordinary skill in drawing, as well as in the mechanical preparation of these very fragile fossils, Prof. Herman Burmeister has been able to present to the scientific world correct pictures of these large animals, and to found in the Museo Publico of Buenos Ayres, one of the best collections of this kind. We find these fossil remains generally in the lowest parts of this formation, and very rarely at the surface. The best places for finding them are the river-banks or "barrancas." Wide as is the distribution of these fossils, not only over the whole Argentine Republic and the Republic of Uruguay, but also further north, to the west as well as to the east, that is to say, to Bolivia, Peru and Brazil, we find them especially abundant near Buenos Ayres and its neighborhood, including an area of about twenty leagues. The animals, however, which are represented by those fossils, lived in the more elevated parts of the country, and their remains were brought down to the low land by the currents of the different rivers. The proof of this view is found in the remains themselves, when we take into consideration the manner in which they are embedded in the pampa mud. We occasionally find a whole skeleton together at the same place; of course, in such a case the animal has died on the spot where it is found; but more frequently we find the different parts of the body separated from one another, and in such a manner that the more solid and compact parts of the trunk are together, while the external and more easily separable parts, such as the head, the extremities and the tail, are separated from the rest, and often are embedded in different strata of this sediment. This fact shows that the extinction of these animals could

never have been the result of a cataclysm, but that it has been produced in the ordinary way, and that afterwards they were imbedded in the sediment of the rivers.

To arrive at a true and natural explanation of the origin of this very extensive formation, we have only to study the different causes which are now at work upon the configuration of the continent, namely, river-action and volcanic forces.

Below this pampa mud we find an extensive formation, the marine character of which is proved by the different remains of sea-animals which are found in it, namely, marine shells, Echinoderms, Crustaceans and marine fishes. The diluvium covers the greater part of the Republic, but in consequence of a want of natural sections and cuts, satisfactory exposures are rarely to be found. This formation belongs to the Tertiary period and consists of two divisions. The lower is called, by Alcide D'Orbigny, the "Système guaranien," and the upper, the "Système patagonien."

The former corresponds to the European lignite formation, and is developed, particularly on the eastern side of the Rio Paraná, commencing in the Missiones and extending southward to the mouth of the river Corrientes. This formation consists, in the lower part, of red, ferruginous sandstone which is covered with a ferruginous limestone, over which layers of gypseous clay are found. These three parts contain no fossils and belong to the same epoch. In the Uruguay Republic, near the city Mercedes, on the Rio Negro, I had an opportunity of studying the southern end of this formation, which is very well developed at that place; I searched several days for fossils, but could find none. In the Brazilian province of Rio Grande do Sul, on the Rio Jacuy, lignite is found in this formation, for which reason it must be compared with the European lignite-formation.

The geognostical and paleontological character of the upper tertiary formation (Système patagonien) is very different from that of the lower division. This formation is also very well developed on the eastern side of the Paraná, and especially in the neighborhood of the city of Paraná. We find it also in the Uruguay Republic, near Viv-oras, on the Rio Uruguay, as indicated by the presence of shells typical of this division, namely, *Venus Münsteri* and *Ostrea patagonica*. In comparison with European sediments this division belongs to the Molasse formation.

The extent of the tertiary formation over the La Plata States cannot be determined at present for want of sections; but in boring an

artesian well at Buenos Ayres it was found at the depth of 280 feet; and, probably, this tertiary formation extends below the surface to the Cordilleras. Other sedimentary formations are not known as yet in the Argentine Republic.

Some volcanic products, namely, Amygdaloid and Melaphyr and also Granite and Syenite with Gneiss and Amphibclis, are found in the La Plata States. Southern Brazil, the Uruguay Republic, the island Martin Garcia at the mouth of the Uruguay, and the chain near San Piedras, are very rich in these rocks.

Montevideo, or San Felipe puerto del Montevideo, the capital town of Uruguay, stands upon a promontory which consists of gneiss; but the "Cerro de Montevideo," a conical hill one hundred and fifty metres high, consists only in the lower and eastern part of gneiss, the western side and the top being composed of amphibolis which changes into diabas.

In concluding my paper I will mention one fact which deserves to be better known to the scientific world. It is the occurrence of large masses of *meteoric-iron* in those extensive northern plains which are called "el Gran Chaco." These plains lie eastward from the Rio Salado, and from the 19th degree extend in the Bolivian province Chiquitos, to the 30th degree of south latitude; and from the 40th to the 45th degrees of longitude westward from Ferro. The rivers Pilcomayo and Vermejo flow through this country, which at present belongs neither to Bolivia, to Paraguay, to Brazil nor to the Argentine Republic. Different Indian tribes are still the possessors of this large territory. To study these Indian tribes and make them more useful to the Argentine Republic, Mr. Porter Cornelius Bliss, a North American citizen, was sent to that country, by the government, in the month of February, 1863. After his return to Buenos Ayres he reported to the national government the results of his investigations. In this valuable report, Mr. Bliss stated that the ground of the Gran Chaco is covered in several places with large masses of meteoric-iron. This meteoric-iron contains 10 per cent. of nickel; that of Macama in Bolivia contains only 2 1-2 per cent. of nickel. To make the statement of Mr. Bliss more complete, I will add that a large mass of meteoric-iron, of nearly 30,000 pounds weight, was found, at the end of the last century, at Otumpa, in latitude 27° or 28°, about seventy leagues eastward from Santiago. Mr. Parish, the well-known English traveller, sent, during his stay in this Republic, a large piece to London, where it is preserved in

the British Museum. This meteoric-iron contains, according to an analysis of Mr. Turner, 93.4 iron, 6.618 nickel and 0.535 cobalt. In the reign of the Spaniards the manufacture of meteoric-iron was not permitted, in consequence of which but little attention has been given to this important subject. To Mr. Bliss belongs the credit of having brought it to the attention of the government and the scientific world.

The foregoing forms but a short sketch of the present known geology of the Argentine Republic which I had intended to present to the Society. But I hope that the many railroads which are being built at present, particularly through mountainous parts of this Republic, will afford the means of increasing our knowledge of the geology and paleontology of this country, as they have of Europe, Asia and North America.

Mr. Edward Pickering, Dr. C. F. Winslow, Messrs. C. J. Sprague, R. C. Greenleaf, and W. H. Niles were appointed a committee of nomination, and were requested to present at the next meeting, a candidate for the office of President, made vacant by the resignation of Professor Jeffries Wyman.

LIST OF ILLUSTRATIONS.

ERRATA.

Page 85, line 14. For MALE read FEMALE.
Page 126, lines 8 and 9. Omit *Vivipara decisa* Gill, Proc. Phil. Acad.
Page 148, lines 24 and 25. For *Totteniana* read *Tottenia.*
Page 221, lines 5 and 8. For *Rutulus* read *Eurymedon.*
Page 169, line 22. For Cab*en*odes read Cab*er*odes.
Page 284, line 25. Insert comma between *consolidated* and *at.*

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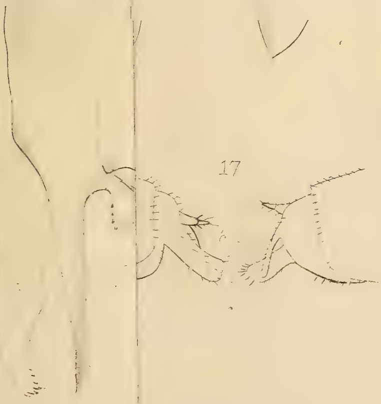

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